Patterns and Correlates of Tobacco Use among Young Adults at College and University

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Abstract

This thesis describes college and university students' smoking behaviours and examines whether socioenvironmental and personal characteristics experienced during adolescence are differentially associated with their smoking participation. Results show more college students than university students currently smoke (37% and 21% respectively) and more began smoking prior to post-secondary school (93% and 84% respectively). Early age of onset of alcohol use increased the odds of current smoking (main effect model, OR = 8.56 CI = 6.47, 11.33), especially for university students (interaction effect model, b = 2.35 CI = 7.50, 14.64). Lower levels of high school connectedness were associated with increased odds of current smoking but for university students only (interaction effect model, b = -0.15 CI = 0.84, 0.88). While limitations associated with convenience sampling and low response rate exist, this is the first Canadian study to examine college and university students separately. It reveals that tobacco control programming needs to differ for college and university students, and early alcohol prevention and school engagement programs for adolescents may influence tobacco use. Given that both educational pathway and use of tobacco are associated with SES, future research may consider examining in more detail, SES-related socioenvironmental variables.

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Chapter 1: Introduction

For the most part, decades of tobacco control efforts have produced declines in the prevalence and rates of tobacco use among Canadians; however, the notable exception is smoking among young adults. Among young adults, rates of smoking have declined the least and have remained somewhat constant over the past few years (CTUMS, 2009). This may be a result of our lack of understanding of tobacco use across various age groups. Conventionally, research has focused heavily on smoking uptake among youth and smoking cessation among older adults. But until relatively recently, smoking patterns of young adults have received very little attention. An increased understanding of tobacco use may help to enhance our efforts to reduce the high smoking prevalence among young adults. Therefore, more research on the patterns and correlates of tobacco use among young adults is warranted. Furthermore, research must also address the heterogeneity of the young adult population. Given that there is a strong relationship between socioeconomic status and smoking; research should be directed to the characteristics of young adults that are related to socioeconomic status. For example, there is research that indicates that young adults who are employed versus those who are enrolled in post-secondary education differ in both their smoking prevalence and their frequency of use (Hammond, 2005; Lawrence, Fagan, Backinger, Gibson & Hartman, 2007). Differences have also been observed among employed and unemployed young adults where smoking has been reported to be higher among unemployed young adults (Green et al., 2007). These observations suggest that young adults are indeed not a homogeneous group and that even among young adults who are attending post-secondary school; those in college would differ in their smoking characteristics and behaviours from those in university.

In Canada, the relationship between educational attainment and tobacco use has been established such that with less education, there is increased smoking. However, most smoking begins in adolescence or young adulthood before educational attainment is complete. This suggests that there are factors that associated with both educational pathways (i.e., selecting to go to college or university) and tobacco use behaviour. These factors may include the social environment during adolescence such as family relationships and sense of belonging to school, as well as personal characteristics such as relative age and substance use behaviour. Therefore, the purpose of this thesis was to determine whether or not personal characteristics and socioenvironmental influences experienced during adolescence were related to current smoking among young adults at college versus university. Furthermore, this thesis examined differences across college and university students' smoking rates and whether these factors predicted these differences. The general research questions that this thesis addressed were as follows:

1) What are the smoking patterns of college and university students?
2) To what extent are socioenvironmental influences and personal characteristics associated with college and university students' current smoking?
3) Do socioenvironmental influences and personal characteristics moderate the relationship between school and smoking?

In order to examine the association between the smoking status of college and university students and the socioenvironmental and personal factors, a dataset that assessed the tobacco use behaviours among postsecondary students in Ontario was used (Prevalence Study Dataset). The data come from an online survey that collected data on tobacco and substance use behaviours, family, school and peer experiences during both

high school and current school. Characteristics associated with socioenvironmental influences and personal characteristics and tobacco use were described using bivariate analyses. A series of logistic regression models were employed to determine how socioenvironmental influences and personal characteristics were related to smoking and were differential for college and university students. The examination of conditional relationships between school status (college versus university) and both personal characteristics and socioenvironmental influences were examined to assess whether they each moderated the relationship between school and smoking.

Overall, this study is an important contribution to the literature for two reasons. First, there has been no study to date in Canada that differentiates the smoking behaviour of college and university students. Second, in order to reduce the smoking prevalence among young adults and to decrease the future burden on society it is important to understand why young adults continue to smoke.

Chapter 2: Literature Review

2.1 Tobacco Use in Canada

2.1.1 Overview. According to a recent report using data from various Canadian sources (Reid & Hammond, 2009); the prevalence of smoking among all Canadians over the age of 15 years has declined by about 20% since 1999. The latest results of the Canadian Tobacco Use Monitoring Survey (CTUMS, 2008) show 18% of Canadians are current smokers. This is a statistically significant decrease in the smoking prevalence compared to the smoking prevalence of 20% in 2004. While a decline in smoking prevalence has been evident among most age groups in Canada, the rate of decline has been much less steep among young adults (see Figure 1).

2.1.2 Tobacco use among young adults. In 2008, 27% of young adult Canadians (20 to 24 years old) smoked cigarettes (CTUMS, 2009). This is well above the overall prevalence of 18% for all Canadians (over 15 years of age). Similar patterns have been observed in previous years; specifically, the prevalence of smoking has been consistently higher among young adults than the Canadian population in general, and has typically been the highest across all age groups. Furthermore, while the prevalence of smoking has declined for all Canadians over the age of 15 years, tobacco use among young adults has appeared to have shown the slowest rate of decline with the greatest decline found among adolescents aged 15-19 years (Reid & Hammond, 2009). This slower rate of decline in smoking prevalence among young adults has occurred not only in Canada (Hammond, Tremblay, Chaiton, Lessard & Callard, 2005) but in the United States as well (Solberg, Asche, Boyle, McCarty, & Theole, 2007).

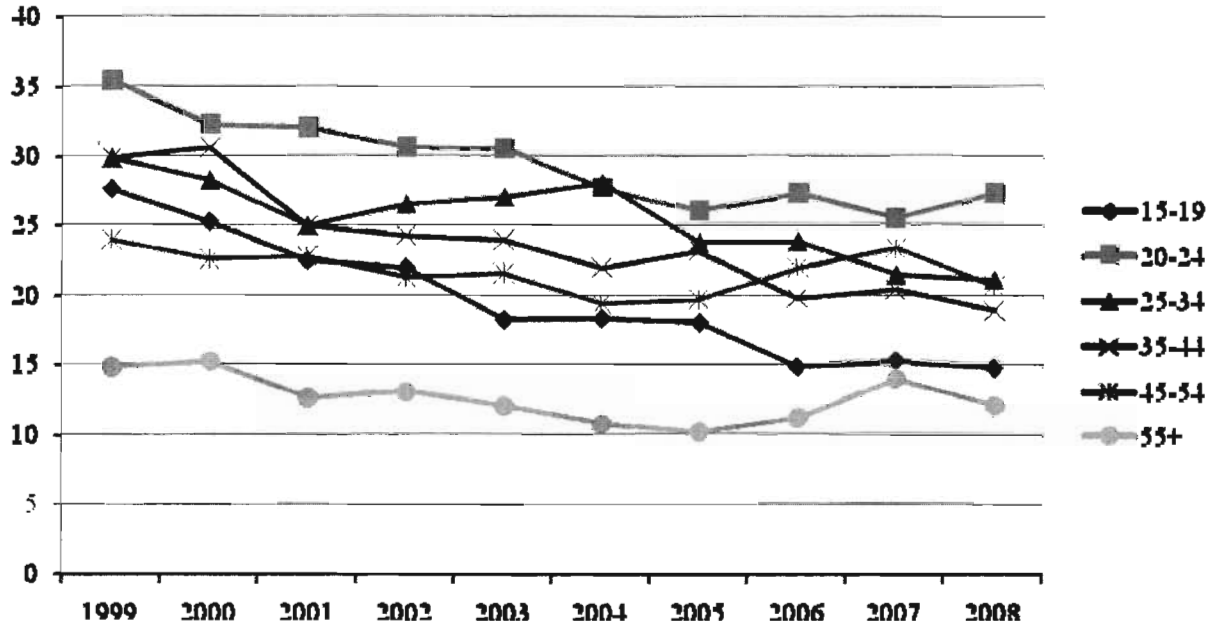

Figure 1. Current smoking prevalence by age group, 1999-2008 (CTUMS, 1999-2008)

While the prevalence of tobacco use is highest among the young adult cohort, the amount of tobacco consumed by young adults is lower relative to older adults. In 2008, young adult daily smokers smoked an average of 12.2 cigarettes per day while adult daily smokers (25 years and older) smoked 15.4. Furthermore, fewer young adults than older adults are daily smokers. For example, in 2008, 19% of young adults compared to 13% of adults over the age of 25 were less-than-daily smokers. Recent research also suggests that patterns of binge smoking may be more common among young adults than older adults (Colder et al., 2006; Colder, Flay, Segawa, Hedeker & TERN members, 2008).This is especially true on post-secondary campuses where smoking paired with drinking are often higher on weekends (Colder et al., 2006; Colder et al., 2008). Because bouts of binge smoking are not reflected in measures of daily tobacco consumption, it may be that the young adult rates of consumption are underestimated by traditional measures of 'cigarettes per day' obtained from daily smokers. Overall then, young adults' unique patterns of tobacco use and continued high prevalence of smoking suggest that this cohort warrants further attention.

Based on the assumption that a better understanding of tobacco use in a population would improve efforts to curb smoking, more research is needed into patterns and correlates of young adult tobacco use. Moreover, this research must acknowledge the heterogeneity of the young adult population. There is evidence, for example, that young adults who are attending postsecondary education differ from young adults who are employed in terms of their tobacco use (Hammond, 2005). Post-secondary students typically have a lower smoking prevalence rate and smoke fewer cigarettes per day than their peers who are employed (Hammond, 2005).

Unemployed young adults have also been observed to have different beliefs and behaviours related to smoking and quitting when compared to their peers who are employed. Unemployed young adults have a higher smoking prevalence and higher odds of heavy smoking (20+ cigarettes per day) compared to young adults who are employed (Green et al., 2007). Finally, smoking prevalence is also lower among young adults who work in professional and administrative positions compared to those employed in the trades, the technical, and the industrial sector (Hammond, 2005; Lawrence et al., 2007). Clearly, young adults are not a single homogeneous group.

2.1.3 Tobacco use among young adult students. In Canada, a large number of young adults attend college and university. Young adult post-secondary students make up almost 30% of all young adult smokers and 7% of smokers of all ages (Hammond, 2005). In fact, 'student' is the single largest occupational category among young adult smokers. Determining the smoking behaviours of young adults in school therefore would contribute to our understanding of young adults' tobacco use and could ultimately enhance our understanding of how to reduce the smoking prevalence in this age group. The following section will review the current literature on the smoking patterns of young adults who attend either college or university.

In the U.S., the terms college and university are used almost interchangeably. In Canada, however, these two words are used in reference to different forms of post-secondary education. For this review, the term university refers to institutions that grant three and four year degrees. The term college is used in this review to refer to diploma- or certificate-granting institutions such as community colleges.

Smoking initiation. Ample research has shown that cigarette smoking is a common and well documented behaviour among both college and university students (Clarkin, Tisch & Gliksman, 2008; Emmons, Wechsler, Dowdfall & Abraham, 1998; Green et al., 2007; Johnston, O'Malley & Bachman, 2004; Wechsler, Rigotti, Gledhill-Hoyt, & Lee, 1998). What is less frequently studied and acknowledged is the frequency and process of smoking initiation among post-secondary students. Historically, most of the research examining initiation of smoking has focused on adolescence (Albers, Biener, Siegel, Cheng & Rigotti, 2008; Choi, Gilpin, Farkas & Pierce, 2001; Farkas, Gilpin, White & Pierce, 2000; Song et al., 2009). More recent studies, however, suggest that some smoking initiation also occurs in early adulthood (Cairney & Lawrance, 2002; Hailpern & Viola, 2005; Hammond, 2005) and regular smoking may not occur until the ages of 21 to 25 (Hammond, 2005; Hammond et al., 2005). In Canada, for example, a national representative study of post-secondary students found that 20.5% of current smokers and 15.7% of formers smokers said they started after the age of 19 years and more than 30% reported the onset of their smoking to be between 18 and 24 years (Cairney & Lawrance, 2002). Hammond (2005) similarly found that approximately 20% of smokers started smoking after they were 18 years old.

This pattern of initiation may be related to the life transitions and adjustments made by young adults who are moving from high school into college and university (Arnett, 2005). The process of adapting to new social networks, living arrangements, increased school and work requirements have all been linked to smoking initiation and escalation (Gfroerer, Greenblatt & Wright, 1997). Researchers have also suggested that efforts to prevent initiation among adolescents may have only simply postponed

initiation. The assumption that if adolescents do not begin smoking, they never will is not supported by the data (Staten et al., 2007).

Patterns of consumption. The social context of post-secondary campuses appears to facilitate smoking (Thompson et al., 2007). Not only do some young adults initiate smoking upon arriving on campus, it also appears that college and university students who smoked at least occasionally are more likely to smoke more after arriving on campus. Smoking may escalate at parties, clubs or bars that are often associated with post-secondary social settings (Gilpin, White & Pierce, 2005a). According to Colder and colleagues (2006), smokers at university make a clear distinction between weekend and weekday smoking: weekends are for parties with lots of drinking and smoking. Studies of university students' behaviours have shown that smoking is higher on weekends than weekdays especially at the beginning and conclusion of semesters (Colder et al., 2008; Colder et al., 2006). In another study with a representative sample of U.S. college and university students, 51% of tobacco users reported smoking mainly in social contexts with other people as opposed to smoking alone (Moran, Wechsler & Rigotti, 2004).

Stromberg, Nichter and Nichter (2007) identified two types of light smokers among students at two universities sampled in the U.S: smokers who smoked at parties and smokers who smoked at parties and during the week when bored or stressed. This pattern showed students moving from exclusively socially smoking (at parties only) to smoking as a way to deal with other circumstances. Unfortunately, for many young adults, this escalating pattern of tobacco use leads to chronic or habitual use of tobacco. Many studies have found that students who are smokers in their first year of post-secondary studies are still smokers by their last year and even further into adulthood

(Gilpin, White & Pierce, 2005b; Kenford et al., 2005). For example, Harris, Schwartz and Thompson (2008) found a 39% increase in tobacco consumption for all students in their sample of freshmen, sophomore, junior and senior students.

Because most young adults who initiate smoking at a young age will remain smokers into their later adulthood (Gilpin et al., 2005b; Kenford et al., 2005), the high prevalence of smoking among young adults foreshadows the continuing burden of tobacco use into the future. Even a brief experiment with smoking in adolescence or young adulthood increases the risk of lifelong smoking because it overcomes the barrier of having a first cigarette (Gilpin et al., 2005b). As young adults' smoking careers lengthen, so do the burdens placed on society due to smoking related illness, increased government funding to programs that support smoking cessation, loss of human productivity, increased medical costs to the health care system, and so on. These individual and societal consequences of tobacco use are explored below.

2.2 The Burden of Tobacco Use

2.2.1 Individual consequences of tobacco use. There are numerous negative health consequences as a result of tobacco use. To begin, smoking has been well established as a leading cause of disability, disease and death among people in Canada (Health Canada, 2009) and the United States (U.S.) (Centers for Disease Control, 2002). Some of the diseases and disorders related to tobacco use include coronary heart disease, chronic obstructive pulmonary disease, and stroke. Additional individual consequences of tobacco use include decreased quality of life and decreased physical performance. Also related to health consequences is addiction. Nicotine is a highly addictive drug (Hu, Davies & Kandel, 2006). Compared to other addictive substances, tobacco users show the

highest proportions of those addicted, highest relapse rates after cessation and the highest number of deaths (Hu, Davies & Kandel, 2006). On the understanding that the personal health consequences of tobacco use are apparent and well documented, they will not be detailed further in this thesis.

2.2.2 Social consequences of tobacco use. In 2000, there were 2.1 million deaths worldwide due to tobacco (Mackay& Eriksen, 2002). The number of deaths due to tobacco exceeded those due to acquired immunodeficiency syndrome, legal and illegal drug use, road accidents, murder, and suicide combined (Mackay & Eriksen, 2002). According to The World Health Organization (WHO), tobacco use is the largest preventable cause of cancer in the world with approximately 80-90% of all lung cancers caused by tobacco (WHO, 2009). In Canada in 1998, the proportion of deaths attributable to smoking (both active and passive smoking) was 22% (Makomaski & Kaiserman, 2004). To the extent that young adults continue to initiate and maintain their tobacco use, tobacco-related diseases and disorders will persist in the Canadian population.

Smoking will also continue to negatively impact the broader society in terms of health, the economy, and the environment. Today, one of the major economic costs due to tobacco use is large health care expenditures. In 2002, $1.6 billion dollars was spent on health care in Canada because of tobacco. Every year, 10% of all fire deaths in the world are a result of smoking (Mackay & Eriksen, 2002) and in Canada from 1995 to 1999, the cost of damages from fires caused by cigarettes totalled $200 million dollars (Health Canada, 2007). In fact, careless smoking in the home is a leading cause of death in home fires in Canada (Canada Safety Council, 2006). Other economic consequences include damages to buildings from fires, loss of employee productivity and employee

absenteeism. Environmental issues with tobacco growth include the increased use of fertilizers and pesticides, deforestation for curing tobacco leaves and the use of land which could otherwise be used for growing fruits and vegetables (Mackay & Eriksen, 2002). As the burden of disease increases with the high prevalence of smoking, so will the economic and environmental costs due to smoking.

2.2.3 Who bears the burden of tobacco-related costs? Across all age groups, Canadians from lower socioeconomic (SES) groups bear the largest burden of tobacco use and the resultant negative consequences. The greatest health disparities are evident between those who have the highest SES and those who have the lowest. Because smoking is a risk factor for a number of chronic diseases, it is likely that current social gradients in smoking will continue to produce a heavier burden of tobacco related disease among individuals from lower versus higher SES groups. Considering that lower-paying blue/pink collar occupations, trades and skilled labour positions are traditionally associated with a college education whereas higher-paying professional careers are typically linked to university education, it might be expected that the uneven burden of tobacco use would be seen even within college and university settings. However, this has not been investigated in the Canadian context.

2.2.4 Summary

The persistently high prevalence of tobacco use among young adults is troubling because: (1) tobacco use in young adulthood generally continues well into adulthood where it results in serious negative health consequences for the individual and society as a whole; and (2) it suggests that decades of tobacco control efforts have had little success with this population.

Addressing these issues will require a better understanding of young adults' tobacco use. To this end, the large number of young adults at post-secondary institutions makes college and university campuses the perfect settings to study the smoking behaviour of young adults and to provide insights into how to decrease the current high smoking prevalence among young adults. Unlike existing literature however, future studies need to distinguish between college and university students, rather than treating them as a single homogeneous group. After all, young adults typically enter college or university via disparate pathways reflecting divergent personal characteristics and socioenvironmental influences that may be associated with educational choices as well as tobacco use (Barr-Telford, Cartwright, Prasil & Shimmons, 2003; King & Warren, 2006; Lambert, Zeman, Allen & Bussière, 2004). Indeed, the robust relationship between educational attainment and tobacco use, combined with the observation that most tobacco use uptake actually occurs well before education has been completed, suggests that factors influencing educational pathways may be related to tobacco use behaviours. Therefore, among young adults who are in post-secondary school, it seems likely that college and university students would differ. Research examining tobacco use of young adults with different educational backgrounds would enhance our overall understanding of young adult tobacco use.

The next sections of the literature review examine the relationships among socio-political factors and the burden of tobacco. This sets the stage for an examination of various sociodemographic, social and personal factors that are related to both educational pathway and tobacco use. The aim of the review is to identify variables that may be

associated with both educational pathways (i.e. the choice to pursue college versus university) and the uptake and use of tobacco.

2.3 SES, Education and Tobacco Use

2.3.1 Socioeconomic status. Socioeconomic status typically reflects income level, occupation and education level (Krieger, Williams & Moss, 1997), such that greater income, occupational status and education are associated with higher SES. Education, in particular, provides individuals with more opportunities to form social networks and gain employment, which in turn, provides income for food, shelter and other resources which help to encourage growth and overall health (Ross & Mirowsky, 1999). Thus, higher levels of education protect people against poor health by influencing lifestyle choices and enhancing ability to build health-protective skills and assets (Winkleby, Jatalis, Frank & Fortmann, 1992). Higher levels of education may coincide with positive attitudes toward health, greater access to health services and providers, greater health literacy and a higher likelihood of taking preventative health measures such as avoiding or quitting smoking (Ross & Mirowsky, 1999).

2.3.1.1 SES and tobacco use. In the 1950s and 1960s, SES was positively associated with smoking (Chilcoat, 2009). When the 1964 Surgeon General's report (U.S. Department of Health, Education, and Welfare, 1964) on the negative health consequences of smoking was released, those who had higher levels of SES became much less likely to smoke – presumably because of their increased knowledge about the negative health consequences of smoking and their increased access to resources that may have enabled them to quit smoking. Over the ensuing decades, the relationship between SES and smoking changed such that, today, smoking is more common among people of

lower SES (Escobedo, Anda, Smith, Remington & Mast, 1990; Giovino et al., 1995; Wagenknect et al., 1990).

Examples of the inverse relationship between SES and smoking participation are found in the following studies. In a cross-sectional analysis of cigarette smoking and quitting behaviours of unemployed adults, Fagan and colleagues (2007) found that participants who had lower education, or lower income or worked in the service and blue collar industry were more likely to be current or former smokers. In addition, lower SES was related to less quitting among adults. In this study, different aspects of SES (education, income and occupation) were each related to smoking.

In another cross-sectional analysis of smoking and SES, Siahpush, Heller and Singh (2005) found that lower income was associated with a 38% longer smoking duration. In addition, quitting was more likely to occur among those with higher income (Siahpush et al., 2005).

Not only is SES related to smoking status, duration of smoking and quitting, but SES is also related to smoking over the life course. Childhood SES can actually set the pattern for tobacco use in adulthood. In a longitudinal study, Gilman, Abrams and Buka (2003) used the respondents' childhood SES (measured as their parents' SES). They determined that lower levels of parental SES were related to an increased risk of smoking initiation, an increased risk of progression to regular use, and a decreased likelihood of quitting. Specifically, parental occupation was predictive of smoking initiation, maternal education was predictive of the progression to regular use, and childhood poverty was predictive of both smoking initiation and (the absence of) smoking cessation. Thus, being economically disadvantaged at a young age was associated with smoking in adulthood.

Lower parental SES and increased likelihood of smoking has also been found in studies of the adolescent population (Lowry, Kann, Collins & Kobe, 1996; Conwell et al., 2003); although some exceptions do exist. For example, when Conrad, Flay, and Hill (1992) conducted a review of 21 studies of adolescent smoking and parental SES, they found the usual inverse association between parental SES and teens' smoking participation in 16 (76%) studies, and no relationship in 5 (24%) of the studies. In a more recent review by Hanson and Chen (2007), approximately 68% of the studies reviewed suggested that lower parental SES was associated with greater adolescent smoking. The relationship between lower SES and tobacco use appeared more often in young adolescents (10-14 years old) than in older adolescents (15-21 years old). Finally, Soteriades and DiFranza (2003) found that both parental education and household income were inversely associated with adolescent smoking status, even after adjustment for age, sex, and race. Thus, the literature generally suggests that adolescents from families of lower SES may be at a greater risk of smoking than those from higher SES families.

2.3.1.2. SES and Education. The literature also suggests that SES is related to selecting to pursue post-secondary education. Specifically, adolescents from low SES families tend to pursue college as opposed to university. One of the reasons they tend to pursue college education compared to university is because of the costs associated with university tuition and the costs associated with studying away from home (Shaienks, Gluszynski & Bayard, 2008). In fact, families with lower financial resources have been found to over-estimate the costs of university tuition and do not consider the "return on investment" that university education provides. As a result, the informal cost-benefit analysis completed by lower income families leads to the conclusion that university is not

a profitable choice (Usher, 2005). Therefore, income often influences post-secondary education choices where typically young adults who have higher educated parents have more resources for them to pursue further education. Not only does income influence educational choices (Barr-Telford et al., 2003; Shaienks et al., 2008) but the educational attainment of parents also influences the value and expectations they place on their children's education, with better educated (i.e., higher SES parents) being more likely to instil in their children a desire and capacity to pursue higher levels of post-secondary education (Barr-Telford et al., 2003; King et al., 2006; Lambert et al., 2004). For example, research indicates that having university-educated parents is associated with being 3.5 times more likely to attend university compared to students who had parents with no post-secondary education (Butlin, 1999; Shaienks et al., 2008). Similarly, students with university-educated parents have also been 3 times more likely to attend community college compared to students who had parents with no post-secondary education (Butlin, 1999). Overall, given that lower family SES is associated with the greater likelihood of tobacco use in adolescence and greater likelihood to pursue college as opposed to university, it seems probable that more college than university students would smoke.

It also seems probable that more college students would smoke since numerous studies have established that educational attainment is correlated with tobacco use in adult samples (de Walque, 2007; Escobedo & Zhu, 1995; Federico, Kunst & Costa, 2007; Gilman et al., 2003; Gilman et al., 2008; Johnson & Novak, 2009; Siahpush et al., 2005; Wetter et al., 2005a; Wetter et al., 2005b; Zhu, Giovino, Mowery & Eriksen, 1996). In a longitudinal study of adults (18+ years) it was found that education and occupation were

related to the onset of daily smoking (Johnson & Novak, 2009). Lower education doubled the risk of becoming a daily smoker over the three years of study (Johnson & Novak, 2009). After controlling for age of onset and years since onset of smoking, neither occupation nor education were related to maintaining or increasing smoking behaviour during the study period leading the authors to suggest that there may be other mechanisms that operate to maintain the use of tobacco and that education and occupation help explain the onset but not the continuation of smoking. Comparing adults with high school education to adults with post-secondary education, Gilman and colleagues (2008) found that high school-educated participants smoked approximately 50 additional pack-years[1], made fewer quit attempts and were less likely to experience long-term abstinence. Unlike the findings of Johnson and Novak (2009), here, level of education was not related to smoking initiation.

While the educational attainment-smoking relationship is well established in the adult population, the relationship between education and smoking in young adults is less clear. This is partly due to the circumstances of young adults' lifecycle stage and developmental tasks. Researchers have noted that most smokers begin smoking in adolescence or young adulthood, before they have "attained" their education (Farkas et al., 2000). In a retrospective analysis of smoking histories of individuals with 12-18 years of schooling, Farrell and Fuchs (1982) argued that smoking patterns could not be influenced by number of years in school because smoking was largely established by the age of 17. Indeed, the Monitoring the Future Study found that 12th grade high school

[1] Pack years is a measure of duration and frequency of smoking that can be used for comparison purposes. A pack of cigarettes contains 20 – 25 cigarettes. 1 pack year= 1 pack (20 -25cigarettes) per day for a year. If a person smokes 1 ½ packs per day for 20 years, they have smoked 30 pack years, whereas a person who smokes ½ a pack per day for 20 years has smoked 10 pack years (National Cancer Institute, nd).

students who had no plans to complete a four-year university degree were 1.45 times more likely to smoke compared to their peers who had planned to complete a degree (Johnson, O'Malley & Bachman, 1999). These findings are consistent with the conclusions of Farkas and colleagues (2000) that there are one or more 'third' variables that may be associated with both smoking and years of schooling. Certainly, this speculation—that adolescents who select different educational pathways do have different smoking behaviours (most likely with college students having greater smoking participation than university students)—is one that can be addressed by examining tobacco use among young adults who are currently pursuing college or university educations, and any "third" variables that may be related to both educational pathway and tobacco use.

2.4 Personal Characteristics and Socioenvironmental Influences Related to Educational Pathway and Tobacco Use

Not only are smoking participation and the pursuit of post-secondary education both related to SES, but they are both embedded in a broader matrix of personal characteristics and socioenvironmental influences. Thus, some of the same risk factors that predict adolescent smoking also predict educational choices (and attainment). For example, substance use in adolescence has been related to both lower attainment in school (Register, Williams & Grimes, 2001) and tobacco use among young adults (Lewinsohn, Rohde & Brown, 1999). In addition to substance use behaviours, students' own happiness in secondary school appears to be associated with both substance use during adolescence (Piko & Kovács, 2010) and decisions about post-secondary education (King & Warren, 2006). In the following section, literature addressing personal characteristics and

socioenvironmental influences that may be associated with both tobacco use and educational pathways in young adulthood is reviewed.

2.4.1 Personal characteristics. Both relative age and substance use among adolescents are personal factors that have been known to affect both achievements in school and health behaviour.

2.4.1.1 Relative age.

Relative age and educational pathway. Relative age is related to academic performance and achievement (Allen & Barnsley, 1993; Gledhill, Ford & Goodman, 2002; Goodman, Gledhill & Ford, 2003; Russell & Startup, 1986). Relative age reflects the time of year in which a person is born. For example, people born in the first six months of the year are often categorized as more developmentally mature compared to those who are born in the last six months of the year. There has been some research that has shown that relative age is associated with differences in school performance for children. Goodman and colleagues (2003) found that the youngest children, in terms of relative age, were the most disadvantaged by the educational system. Specifically, these children had lower grades (Russell & Startup, 1986), and more learning difficulties (Gledhill et al., 2002). The disadvantage of a younger relative age also persists into secondary school and post-secondary entrance (Gledhill et al., 2002; Wallingford & Prout, 2000). Older relative age during childhood education has been related to higher educational achievement in young adulthood (Allen & Barnsley, 1993).

Relative age and tobacco use. There currently is no literature that examines relative age effects and tobacco use behaviours, however, some hypotheses about the relationship with tobacco use can be made. First, pubertal maturity has been linked to

substance use in adolescence (Dick, Rose, Viken & Kaprio, 2000) and young adulthood (Hayatbakhsh, Najman, McGee, Bor & O'Callaghan, 2008) where individuals who mature early have had greater substance use. Second, a relative age disadvantage often causes students to struggle in their class to compete with students who are more mature. As a consequence of this struggle, students may have lower self-esteem and lower self-confidence (Thompson, Barnsley & Battle, 2004). Over time, this lower self-esteem and self-confidence may encourage negative behaviours such as smoking as a means to cope with the feelings associated with lower self-esteem and self-confidence. Studies of adolescent (Byrne & Mazanov, 2001) and young adult (Croghan et al., 2006) smokers have found that they are more likely to have lower levels of self-esteem. These combined observations suggest that relative age could have an effect on the smoking status of young adults.

2.4.1.2 Substance use behaviour.

Substance use and educational pathway. Substance use during adolescence has been related to lower educational achievement (Register et al., 2001). King and colleagues (2006) believe that the use of substances such as marijuana and alcohol during adolescence may lead to lower educational achievement during young adulthood. The way in which the relationship may work is through what the researchers call 'selection effects.' Adolescents who use substances may be less likely to select higher education because they are making or forced into choices that lead to other roles such as parenthood, marriage, or full-time employment. Also, teens who use substances may not be selected into higher education because of poor high school performance. Substance users may be a part of a social network whose values are not compatible with higher

education, making these students less successful in school (King et al., 2006). Among teens who are more successful in school, there are probably more constraints on their drinking and drug use due to their fear of failing or upsetting teachers or parents (Crosnoe, 2006). Data from the national Monitoring the Future Study revealed that high school students who planned to attend university drank less alcohol during high school than their peers who were not planning on going to university (Schulenberg, Bachman, O'Malley, & Lloyd, 1994).

Substance use and tobacco use. Substance use is strongly associated with current smoking among teens (Park, Weaver & Romer, 2009; Vega, Chen & Williams, 2007) and young adults (Lewinsohn, Rohde & Brown, 1999; Weitzman & Chen, 2005). Research has consistently found that individuals with an earlier onset of alcohol use are more likely to be current smokers than those who first consumed alcohol at a later age (Takakura & Wake, 2003). King and Chassin (2007) similarly found that the earlier the initiation of alcohol use, the greater the drug dependence in later adulthood. These observations suggest that young adult students who use drugs such as alcohol may also be more likely to smoke.

2.4.2 Socioenvironmental influences. Feelings of connectedness to family and to school are both known to affect teens' academic performance and health behaviours (such as tobacco use) (Faulkner, Adlaf, Irving, Allison & Dwyer, 2009; Foshee & Bauman, 1994; Jeynes, 2005; Lambert et al., 2004). The term connectedness refers to being cared for, feeling accepted and valued and feeling enjoyment from attachment to friends, family, school and the community (Lee & Robbins, 1995). Feeling connected to a family includes a degree of involvement from parents such as the amount of encouragement and

assistance with problems and school work that is provided. School connectedness includes things such as relationships with teachers, homework and schoolwork, the value placed on education and ability to make and sustain friendships (Lambert et al., 2004).

2.4.2.1 Family connectedness.

Family connectedness and educational pathway. Research has demonstrated that adolescents' success in school is dependent upon parental involvement or connectedness to parents. Parental involvement can include good communication, support, encouragement and instruction between parent and child (Mau, 1997). Increased levels of involvement have been found to improve the academic performance of children in both elementary and secondary school (Hara & Burke, 1998). More specifically, one study on parental involvement has found that the communication aspect of involvement (i.e., communicating about school) had a positive impact on adolescent academic performance (Jeynes, 2005).

Family connectedness and tobacco use. Family connectedness is important to understanding the risk behaviours of emerging adults (Padilla-Walker, Nelson, Madsen & Barry, 2008). Family connectedness has been related to positive outcomes in adolescence such as higher self-esteem and greater sense of belonging in school (Chubb & Fertman, 1992). Greater family attachment and more positive relationships with family members have been associated with a lower likelihood of smoking initiation (Foshee & Bauman, 1994), and regular smoking (Miller & Volk, 2002). To the degree that adolescents are supported by their parents, they are more likely to experience positive outcomes in educational achievement and less likely to engage in risky behaviours such as smoking and drug use.

2.4.2.2 School connectedness.

School connectedness and educational pathway. Similar to family connectedness, greater school connectedness has been related to educational outcomes in adolescence and young adulthood. In general, feeling more connected to high school predicts higher academic achievement and greater likelihood of pursuing university education (versus college or no education). In a study of Canadian high school students, researchers found that a large majority (approximately 90%) of the academically-engaged students continued with post-secondary education. Among those who did not continue on with post-secondary education, only 12% had average grades 80% or higher (Lambert et al, 2004). Similarly in the U.S., King and colleagues (2006) found that high academic achievement during adolescence was predictive of both college attendance and completion. Lambert and colleagues (2004) determined that, the more connected teens were to high school—the more engaged they were both academically and socially—the more likely they were to continue their education. Conversely, the Double Cohort Study in 2004 showed that students who were planning to go to college or an apprenticeship program were the least likely to be involved in sports and intramural activities (King & Warren, 2006). College-bound students were also less likely than university-bound students to feel accepted at their high school (King & Warren, 2006).

School connectedness and tobacco use. There is strong support for school connectedness as a protective factor against health risk behaviours in adolescence (Nutbeam, Smith, Moore, & Bauman, 1993; Resnick et al., 1997). Greater connection to high school is associated not only with higher academic performance and lower absenteeism, but with less health risk behaviours such as tobacco use (Dornbusch,

Erickson, Laird & Wong, 2001; Faulkner et al., 2009; Nutbeam et al., 1993). School activities, such as athletics and social clubs may deter students from becoming involved in smoking (Staten et al., 2007). The more students are involved with clubs and activities, the fewer opportunities they may have to engage in negative behaviours such as tobacco use. Similar to family connectedness, the degree to which adolescents are engaged in school, the more likely they will have higher academic performance and the less likely they will use tobacco.

2.5 Conclusion

The research literature reviewed here shows that a high prevalence of tobacco use exists among young adults. This situation may reflect a lack of effective tobacco control practices with young adults that is due to a certain extent to our poor understanding of smoking participation in this age group. Despite the well-established association between SES and smoking (along with its negative health and economic consequences), research addressing young adult tobacco use has largely ignored the educational, occupational and economic heterogeneity of the young adult population. It is unclear whether and how differences in markers of SES (such as education) influence smoking participation among the young adult population. This lack of understanding is somewhat astonishing given the availability of two potentially socioeconomically heterogeneous groups of young adults: college students and university students. As revealed in the literature reviewed here, educational pathways (e.g., to college or university) and tobacco use share some of the same socioenvironmental and personal factors. These socioenvironmental and personal factors, however, may differentially be associated with the educational pathways to college and university. Thus, there is a high probability that college and university

students differ in their smoking participation and the degree to which specific socioenvironmental and personal factors are associated with their tobacco use. Because the factors that influence eventual educational attainment and tobacco use are still playing out during young adulthood and the experiences of youth are still relatively recent and available for recall, examining these socioenvironmental and personal factors in relation to tobacco use among college and university students would elucidate the relationship among smoking and education and the "third" variables that are potentially associated with both. This examination would shed light on differences in patterns of smoking uptake and participation for college versus university students; identify potential differences in predictors of smoking participation for students whose educational pathways led to college or to university; and speak to the inter-relationships among a constellation of personal and social factors that may be associated with both education and smoking among young adults.

2.6 Purpose of the Study

This thesis examines the differences in current smoking patterns of college students versus university students. Moreover, it investigates whether personal characteristics and socioenvironmental influences experienced during adolescence could account for differences in the smoking pattern observed across college and university students.

2.7 Research Questions

The research questions that addressed the purpose of this thesis were outlined as follows:

1. What are the characteristics of smokers and never-smokers attending college and university?
2. What are the smoking behaviours of college and university students?

After controlling for demographic characteristics (age, gender, year of study, and living arrangement), to what extent are:

3. personal characteristics differentially related to the smoking status of college and university students? Do the personal characteristics moderate the relationship between school status and smoking status?
4. socioenvironmental variables differentially related to the smoking status of college and university students? Do the socioenvironmental variables moderate the relationship between school status and smoking status?
5. personal characteristics and socioenvironmental variables differentially related to the smoking status of college and university students? Do personal characteristics socioenvironmental variables moderate the relationship between school status and smoking status?

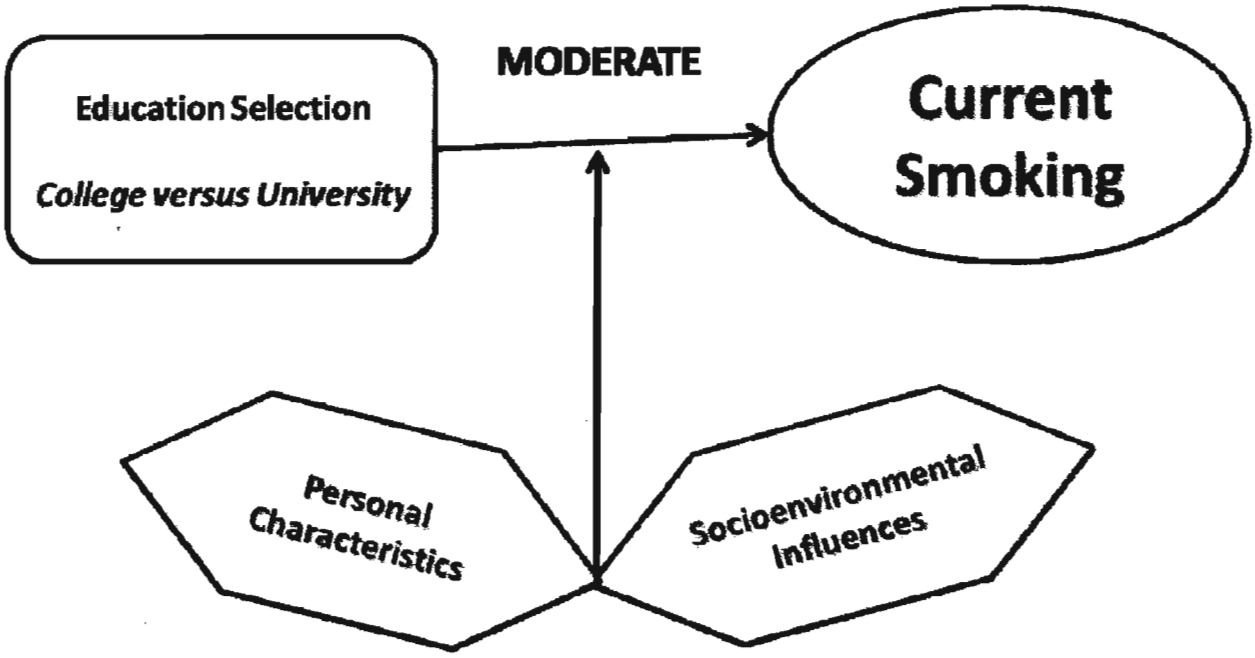

Figure 2. Visual Representation of the Research Questions

Chapter 3: Methodology

3.1 Overview

The data for this study came from the Prevalence Study. The target population for this data collection was all undergraduate college and university students in Ontario. The following sections provide the methods used to obtain the Prevalence Study data set and the final sample used in this thesis.

3.2 Prevalence Study Data Set

Cross-sectional data from the Prevalence Study were collected between November 2005 and January 2006 by researchers from Brock University and University of Waterloo. The Prevalence Study questionnaire included sociodemographic information and measures related to school and family experiences. Information related to students' cigarette patterns of use, social norms and attitudes towards smoking and knowledge of smoking policies were also collected. Additional information obtained on the questionnaire contained measures of marijuana, alcohol use, and other health related behaviours.

3.2.1 Institution selection. To generate a representative sample of the target population of all 43 post-secondary institutions in Ontario, a stratified random selection procedure was used. Institutions were excluded if French was the primary language (n = 3) and if the institution was funded privately (n = 1). Ontario was divided into four geographic regions suggested by the Ontario Ministry of Training, Colleges, and Universities. The four different regions included: Eastern, Northern, Central and Western. English language, public colleges and universities were randomly selected from the identified strata. Overall, 15 colleges and 12 universities were initially selected and given

the opportunity for "first-refusal" to participate in the study (see Table 1). In case "first-refusal" occurred in the first sample, an additional 11 institutions (5 colleges and 6 universities) were randomly selected across the strata. First refusal occurred if the Registrar's Office declined or was unable to support the study or that Research Ethics Board (REB) clearance could not be obtained at each institution at that time. Approval from the REB could sometimes not be obtained due to time constraints or regulations requiring faculty member collaboration.

The procedure used to obtained consent from each of the institution was as follows: a phone call was made to each institution's Registrar's Office by the Research Coordinator, followed by a detailed letter informing the Registrar's office of the research and the role of the institution in the study. Each institution's Registrar's Office was again contacted by phone to ask for co-operation in the study. Each institution's Registrar's office was required to send out a mass e-mail to all undergraduate students on their campus. While this was occurring, approval was also sought from each institution's REB. To be included in the study, only schools that had approval from the Registrar's Office and the REB were included.

Of the 27 institutions (15 colleges and 12 universities) originally selected, 10 institutions (8 colleges and 2 universities) declined or were unable to fulfill the participation requirements (see Table 1). Because of the refusal to participation from the 10 institutions, all five "back-up" colleges across the four strata and two "back-up universities were contacted to participate. An additional two colleges and three universities that had agreed to participate and had ethics clearance did not implement the research protocol.

Table 1

Institution Selection

	Colleges	Universities
round 1	15	12
agreed	7	10
declined	8	2
round 2	5	2
agreed	3	2
declined	2	0
Failed to implement	2	3
TOTAL	**8 colleges**	**9 universities**

Unfortunately, the withdrawal of these institutions from the study only became apparent after data collection had completed; therefore, it was not possible to substitute any of the alternate institutions or determine reasons for their nonparticipation.

3.2.2 Participant recruitment. To generate a list of students' e-mail addresses, each Registrar's Office used their registration software. All students on the generated list were then sent an 'invitation to participate' letter from the Registrar's Office and were eligible to participate in the study. This was the final step for the Registrar's Office. There was no-follow up letters or email reminders sent to the participants.

3.2.3 Survey administration. The Prevalence Study questionnaire was an online survey that was accessed through the invitation letter sent to students by the Registrar's Office. The invitation letter included a description of the study, the website address for the survey and the institutional access code. In order to access the survey, students were required to select the website address in the letter. Students were then brought to the survey's website which provided detailed information on the study's purpose and their participation. If they chose to participate, they granted their consent by selecting an appropriate button on the screen. They were then prompted to enter their institutional code and respond to the individual survey items. It took approximately 15 minutes to complete the questionnaire. Participants were also provided with an incentive to complete the questionnaire. They were provided with a 1-in-10 chance of winning a $10 electronic gift certificate for Chapters Bookstore. Withdrawing from the study during or after completion did not affect whether or not a participant was eligible for the incentive. At the end of the survey, students clicked a hyperlink to a thank you letter. By clicking on

the hyperlink, students were entered in the prize draw. They were also notified that the results of the study would be posted on the website. The thank you letter thanked participants for their contribution in helping to provide information on tobacco use among post-secondary students in Ontario.

3.2.4 Sample. Within each of the 17 participating campuses, all full-time undergraduate students were eligible to participate ($N = 187,972$) resulting in a participating sample of approximately 10,945 students. The response rate for all post-secondary students was 5.8%; however, because some of the e-mails were not delivered or received, a more accurate response rate is 7.3% (Cobb, Graham, Bock, Papandonatos & Abrams, 2005). Because the data were stored in an online data reserve, there were several errors with downloading the data into an excel format and therefore, there were a number of cases that had errors or were incomplete (823 cases). After eliminating these errors, the sample consisted of 10,122 postsecondary students: 7,810 university students and 2,312 college students.

3.2.5 Prevalence Study questionnaire. Please refer to the Appendix C for the full questionnaire. Measures related to only this study are described below. In addition to demographics, the variables used in this study fall under the themes of (1) personal characteristics (relative age and alcohol onset) and (2) socioenvironmental influences (family connectedness and high school connectedness).

3.2.5.1 Demographics. The following demographic data were collected from all respondents: age, gender, year of study and living arrangement. *Age* was a continuous variable that was measured in years. *Gender* was a dichotomous variable where 0 represented female and 1 represented male. *Year of study* was a continuous variable.

Since college and university programs vary in their length of programs (i.e. four-year degrees for university and two-year diplomas for college), year of study was standardized to allow for a comparison between college and university. To standardize, for the separate institutional types, year of study was multiplied by its mean and divided by its standard deviation. The variable, *living arrangement,* had eight options: a campus residence, at a family home, with another family (boarding), and five off-campus options (alone, with other students, with non-student, students and non-students, and romantic partner/spouse). These categories were collapsed into three groups: on-campus residence, family residence, and off-campus residence. A campus residence was classified 'on-campus residence', at a family home was classified as 'family home' and the five off-campus options were classified as 'off-campus' residence. This variable was treated categorically; two vectors were created (on-campus, off-campus) and family home was selected as the reference group.

3.2.5.2 Personal Characteristics.

Relative age. Relative age is an age grouping that represents chronological age (in months) relative to peers (Baker, Schorer & Cobley, 2010). Relative age may interact with development providing advantages to some and disadvantages to others (Baker et al., 2010). Using the respondent's birth month, a variable to represent relative age was created. Quartiles were created based on birth months with '1' representing 'older' (i.e., January, February, and March) to '4' representing 'younger' (i.e., October, November, and December). This was a procedure used similar to past research (Allen, 2008). This variable was treated as a categorical variable; three categorical vectors (1^{st} quartile, 2^{nd} quartile, 3^{rd} quartile) were created and the reference 4^{th} quartile was selected.

Alcohol onset. Alcohol use in adolescence is a form of risky behaviour. Early age of onset of alcohol use (i.e., before the age of 15 years) compared to later age of onset (after the age of 18 years) has been associated with greater drinking in university, as well as a greater likelihood to participate in other drug use (LaBrie, Rodrigues, Schiffman & Tawalbeh, 2007). In this thesis, alcohol onset was assessed using two variables: 1) whether or not respondents used alcohol (yes/no) and 2) the age in which they consumed their first drink (in years). The respondents who reported that they have not used alcohol were categorized in the 'no use' category. To cover all cut-offs in previous research, an additional three categories of alcohol onset were created: early onset (13 years or younger), middle onset (14-18 years), and late onset (19 years and above). Categories were created based on previous researcher's age cut-offs of at or below the age of 13 years as early onset (Gruber et al., 1996; King & Chassin, 2007; Lo, 2000) and the National Institute on Alcohol Abuse and Alcoholism (NIAAA, 2003) cut-off of 19 years (legal drinking age) and above as late onset. Middle onset of alcohol use (14-18 years) was then considered in between these cut-offs and typically represents an acceptable rebellion or expected norm for adolescents (Lo, 2000). This was a similar approach taken by researchers LaBrie and colleagues (2007). Therefore, the four categories of alcohol onset included the following: no use, early onset, middle onset, and late onset. This variable was treated as a categorical variable; three categorical vectors were created (early, middle, late) and a reference category was selected (no use).

3.2.5.3 Socioenvironmental influences.

Family connectedness. A series of five true/false questions were asked about the experience with a father figure (father, stepfather, male guardian) during high school.

Response options originally included 1 = 'usually false', 2 = 'usually true', and 3 = 'N/A'. The 'N/A' response option was recoded to 0 for the analysis of this variable. A total score was created to represent father involvement where higher scores represented more quality involvement with a father figure ($\alpha = 0.83$). The same series of five true/false questions were asked about the experience with a mother figure (mother, step mother, female guardian) during high school. Response options originally included 1 = 'usually false', 2 = 'usually true', and 3 = 'N/A'. The 'N/A' response option was recoded to 0 for the analysis of this variable. A total score was created to represent mother involvement where higher scores represented more quality involvement with a mother figure ($\alpha = 0.72$). The questions for both mother and father involvement were outlined in Table 2. A family connectedness score was created in one of two ways. If participants had scores for both mother involvement and father involvement, then their scores were averaged to create a score that represented involvement from both parents. This is a similar procedure used by other researchers (Good, Willoughby, & Fritjers, 2009). If respondents answered N/A to all five mother involvement or all five father involvement items, they were flagged as having a single parent, and therefore, their score was represented by only the available parental score. To account for single parent families, a variable was created by coding respondents who had either selected N/A to all father involvement questions or N/A or all mother involvement questions. There was a small number of cases ($n = 14$) that had responded N/A to all 10 questions. These cases were included in the single parent category. No significant differences were found between the 14 cases and the cases in the single parent category. The means and standard deviations

Table 2

Father and Mother Involvement Questions

Father Involvement	Mother Involvement
I could count on him to help me out, if I had some kind of problem'	I could count on her to help me out, if I had some kind of problem'
He kept pushing me to do my best in whatever I did'	She kept pushing me to do my best in whatever I did'
He kept pushing me to think independently	She kept pushing me to think independently'
He helped me with my school work if there was something I didn't understand	She helped me with my school work if there was something I didn't understand'
When he wanted me to do something, he explained why	When she wanted me to do something, she explained why

Note. Response options included 0=N/A, 1=usually false and 2=usually true.

for family connectedness for the overall sample, college sample and university sample are presented in Table A1.

High school connectedness. High school connectedness was measured by a series of eight questions based on the high school engagement indicator from Statistics Canada (Statistics Canada, 2008). The responses were on a 5-point Likert scale where 1 represented strongly disagree and 5 represented strongly agree. The questions '*I did as a little as possible; I just wanted to get by*' and '*I felt like an outsider or like I was left out of things at school'* were reverse coded so that higher scores represented greater connectedness. A total score was created to represent overall connectedness to high school where higher scores represented greater high school connectedness ($\alpha = 0.69$). Questions included in the series were outlined in Table 3. The means and standard deviations for high school connectedness for the overall sample, college sample and university sample are presented in Table A1. The correlation between family connectedness and high school connectedness is presented in Appendix A in Table A2.

3.2.5.4 Smoking behaviours.

Smoking frequency. Smoking frequency was measured by a question among respondents who selected 'yes' to current smoking. The question was as follows: '*In the past 30 days, how often did you smoke a cigarette, even a puff?*' Response options included '*every day*', '*almost every day*', '*on some days each week*', '*once or twice all together*', and '*I did not smoke at all*'.

Smoking history. Smoking history referred to the age of smoking initiation, and smoking before or after enrolment. Age of smoking initiation was measured by a question that asked the following: '*How old were you when you smoked your first whole*

Table 3

High School Connectedness Questions

High School Connectedness
I got along well with my teachers'
I did as little as possible; I just wanted to get by'*
I paid attention to the teachers
I was interested in what I was learning in class
I felt like an outsider or like I was left out of things at school'*
I had friends at school to whom I could talk about personal things'
I liked to participate in many school activities (e.g. clubs, sports, drama)
People at school were interested in what I had to say.

Note. * indicates items that were reversed coded for scale construction

cigarette?' Responses were given in years. *Smoking before or after enrolment* (yes, no) was a variable created by taking the age of smoking initiation and subtracting the age of enrolment. Age of enrolment was found by subtracting the year of study (un-standardized) from the respondents' current age. If the value was greater than or equal to 0, then respondents started before enrolment and were given a code of 0. If the value was less than 0, then respondents started after enrolment and were given a code of 1. This variable was included to provide insights into whether college or university enrolment was associated with smoking initiation.

3.2.5.4 Dependent variable: Current smokers versus never smokers. To determine the smoking status of respondents, (current smoking versus never smoking) students were asked two questions. First, students were asked, '*Do you currently smoke – even just a bit?*' (yes/no). Respondents who selected 'no' were then asked the question, '*Are you an ex-smoker?*' (no; no, I still smoke occasionally or regularly; yes, I quit within the last 6 months; yes, I quit more than six months ago). Ex-smokers were than categorized as those who reported that they currently do not smoke and have indicated that they have quit within the last six months or more than six months ago. This category was created based on the Stages of Change Theory (Prochaska & DiClemente, 1983). Never-smokers were respondents who reported that they did not currently smoke and did not identify as an ex-smoker. Current smokers were those who responded yes to the question '*Do you currently smoke – even just a bit?*' (yes/no).

For the purpose of this analysis, only current and never smokers were included because it was difficult to categorize ex-smokers and because including ex-smokers in a smoking category or non-smoking category may introduce bias into the sample. First, the

ex-smokers are no longer smoking so there may be something that makes them different compared to smokers since they successfully quit. Second, ex-smokers are not really non-smokers because they were once smokers and may have quit quite recently. Third, if ex-smokers are put in a non-smoking category, there may be less of an association between smokers and non-smokers and or perhaps greater association if they are put in the current smoker category. Finally, since the purpose of this thesis was to look at the patterns and correlates of tobacco use that can be used for tobacco prevention not cessation, it does not make sense to include ex-smokers in the sample.

3.3 Analytic Strategy

3.3.1 Software. All statistical analyses were performed using SPSS version 17.0. Since it is possible that the hypothesized relationships between smoking and the key variables may go in either direction, a two-tailed significance level of $\alpha = 0.05$ was selected for all analyses.

3.3.2 Cleaning. There were several procedures employed to screen for errors and to ensure greater confidence in the quality of the data. To examine possible errors in responses due to the online survey method, frequencies were generated for all variables of interest. Before screening the sample, variables that had missing cases were identified. In particular, variables that had missing values that could not be imputed were flagged to be screened from the sample. These variables included the dependent variable (current versus never smoking), gender, and living arrangement and when missing scores for both mother and father involvement occurred (all 10 items). All other variables that had missing values were imputed (see section 3.3.4).

3.3.3 Screening. After missing data were identified, a screening procedure was employed. First, for this particular study, only college and university students aged 17 to 24 years were examined. The selection of the age range of 17 to 24 years was included for this study because generally the age 17 represents the youngest age at which students in Ontario enter colleges and universities, and the age 24 years restricts the sample to a more age and developmentally homogeneous sample of students. The age range was also chosen to represent the developmental stage of emerging adulthood (Arnett, 2005). Of the 416 college students screened out for age, 112 were because there were missing scores for age. Of the 801 university students screened out for age, 219 were because there were missing scores for age. Second, respondents' data were removed if they were not single. Only single respondents were included because young adults who are married may have other influences that affect their smoking status. Of the 346 college students screened out for marital status, 63 were because there were missing scores. Of the 792 university students screened out for marital status, 231 were because there were missing scores. Third, respondents' data were removed if they already had a college diploma or university degree and were working towards a second diploma or degree. This was done for essentially the same reasons that age restrictions were applied. Of the 525 college students screened out for having a previous degree, 313 were because there were missing scores for the variable. Of the 1,201 university students screened out for having a previous degree, 757 were because there were missing scores for the variable. The final screen applied to the sample was the removal of ex-smokers. Ex-smokers were removed from the sample so that a more accurate comparison of smokers and never smokers could be made (see Section 3.2.5.4). After these screening procedures were applied, the

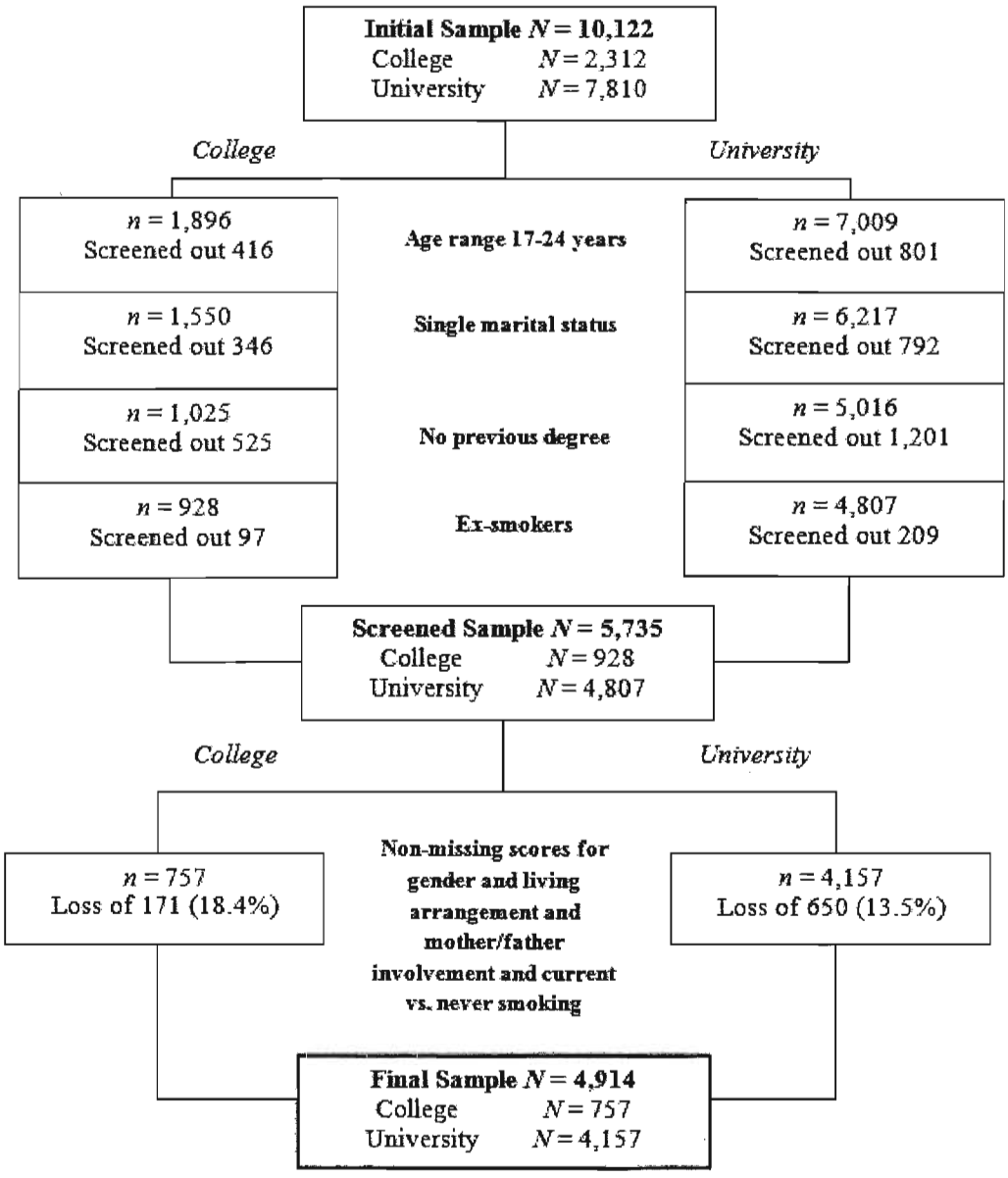

Figure 3. Sample Screening Procedure

screened sample resulted in 5,735 respondents consisting of both college (n = 928) and university (n = 4,807) students aged 17 – 24 years (Figure 3). From the screened sample of 5,735 students, a number of cases were lost to analyses due to missing data. Specifically, respondents were deemed lost if they had missing scores for all of the following: gender, living arrangement, mother and father involvement, and the dependent variable, current versus never smoking. Respondents with missing scores for both mother and father involvement (n = 441) were removed to eliminate bias because these respondents were significantly different from those with valid scores in terms of their age, year of study, living arrangement and age of onset of alcohol use (please see Appendix B). These participants were younger, in a lower year of study, lived in a family home and did not use alcohol.

Table 4 presented the results of a chi-square analysis for the respondents who were selected in the final sample from the screened sample by school status. A greater proportion of college students than expected were deemed lost in the sample. Table 5 presented the results of a chi-square analysis for the missing cases from the screened sample to the final sample by school status. A greater than expected proportion of college students had missing values for gender, living arrangement and smoking status. Figure 3 presented the screening procedures that produced the final sample of 757 college students and 4,157 university students.

As shown in Table 6, there were no mean differences for college students lost and retained in the sample in terms of age, year of study, family connectedness and high school connectedness. As shown in Table 7, the only difference between college students

Table 4

Association between School Status and Missing Cases from Screened to Final Sample

School Status	Selected Cases		Unselected Cases		$\chi^2(1)$
	n	%	*n*	%	
College	757	81.6	171	18.4	
University	4157	86.5	650	13.5	15.26**
Total	4914	85.7	821	14.3	

**$p < .001$. Two-tailed.

Table 5

Association between School Status and Missing Cases Lost from Screened Sample

Variable	College ($N = 928$)		University ($N = 4,807$)		*df*	χ^2
	n	%	*n*	%		
Gender	9	1.0	11	0.2	1	12.29**
Living arrangement	13	1.4	16	0.3	2	17.64**
Missing parental involvement	119	11.6	547	10.9	1	0.40
Current smoking	86	9.3	259	5.4	1	20.70**

*$p < .05$. **$p < .001$. Two-tailed.

Table 6

Mean differences between Lost and Retained College Sample Cases

Variable	College ($N = 928$)				*df*	*t*
	Lost ($n = 171$)		Retained ($n = 757$)			
	M	*SD*	*M*	*SD*		
Age	19.80	1.60	19.84	1.55	926	0.32
Year of study	1.67	0.78	1.64	0.75	866	-0.33
Family connectedness	5.23	1.52	5.52	1.51	812	1.41
High school connectedness	26.76	2.85	26.81	2.73	908	0.06

$^{**}p < .001$. Two-tailed.

Table 7

Associations between Cases Lost and Retained for College Sample

Variable	College ($N = 928$)				*df*	χ^2
	Lost ($n = 171$)		Retained ($n = 757$)			
	n	%	*n*	%		
Gender						
Female	54	17.3	498	82.2	1	0.05
Male	108	17.8	259	82.7		
Living arrangement						
On-campus	17	15.3	94	84.7	2	1.43
Off-campus	71	19.0	302	81.0		
Family home	70	16.2	361	83.8		
Single parent						
Yes	5	6.0	79	94.0	1	9.56*
No	166	19.7	678	80.3		
Relative age *(n, %)*						
1st quartile (Jan –Mar)	37	16.2	192	83.8	3	1.26
2nd quartile (Apr – Jun)	46	19.0	196	81.0		
3rd quartile (Jul – Sep)	46	20.1	183	79.9		
4th quartile (Oct – Dec)	39	18.5	172	81.5		
Alcohol onset *(n, %)*						
No use	116	43.6	150	56.4	3	157.50**
Early onset (≤13 years)	15	9.0	152	91.0		
Middle onset (14-18 years)	38	8.2	423	91.8		
Late onset (≥19 years)	2	5.9	32	94.1		
Smoking status						
Current	38	11.9	280	88.1	1	1.94
Never	47	9.0	477	91.0		

**$p < .001$, two-tailed.

who were (n = 757) and were not (n = 171) retained in the final sample occurred for single parent and age of onset of alcohol use. There was a greater than expected proportion of students from dual parent families and non-users of alcohol that were deemed lost. As shown in Tables 8 and 9, the differences between university students who were (n = 4,157) and were not (n = 650) retained in the final sample occurred for age, year of study, living arrangement, single parent, and age of onset of alcohol use. Those deemed lost were younger and in a lower year of study. There was a greater than expected proportion of students that lived in a family home, were from dual parent families and non-users of alcohol deemed lost.

3.3.4 Missing values. There were a number of missing values on some selected variables in this study (Table 10). It appeared that respondents were missing information about their mother and father involvement and age of onset of alcohol use due to the placement of the question on the questionnaire. These questions were near the end of the questionnaire and it may be that the students did not spend that much time on the questionnaire or they may have been tired by this time and did not respond.

All analyses examining lost and retained cases were completed using a non-imputed dataset. In order to have a sample with valid scores on all variables of interest, missing values were imputed following the maximum likelihood estimation (MLE) procedure in SPSS. The MLE seeks values for the parameter that maximize the likelihood function. In other words, MLE will find a probability distribution that makes the observed data most likely (Myung, 2003). The final imputed dataset was used for all subsequent analyses.

Table 8

Mean differences between Lost and Retained University Sample Cases

Variable	University ($N = 4,807$)				*df*	*t*
	Lost ($n = 650$)		Retained ($n = 4,157$)			
	M	*SD*	*M*	*SD*		
Age	19.91	1.57	20.09	1.58	4805	2.74*
Year of study	2.40	1.15	2.52	1.11	4712	2.63*
Family connectedness	5.72	1.48	5.48	1.36	4263	-1.87
High school connectedness	31.43	4.45	31.53	4.53	4713	0.54

**p <.001. Two-tailed.

Table 9

Associations between Cases Lost and Retained for University Sample

Variable	University ($N = 4,807$)				*df*	χ^2
	Lost ($n = 650$)		Retained ($n = 4,157$)			
	n	%	*n*	%		
Gender						
Female	457	13.5	2917	86.5	1	0.48
Male	182	12.8	1240	87.2		
Living arrangement						
On-campus	170	15.0	961	85.0	2	16.21**
Off-campus	277	11.3	2172	88.7		
Family home	187	15.4	1024	84.6		
Single parent						
Yes	5	2.0	249	98.0	1	30.61**
No	645	14.2	3908	85.8		
Relative age						
1st quartile (Jan –Mar)	186	15.6	1007	84.4	3	7.62
2nd quartile (Apr – Jun)	163	13.6	1034	86.4		
3rd quartile (Jul – Sep)	147	12.3	1050	87.7		
4th quartile (Oct – Dec)	137	12.2	985	87.8		
Alcohol onset						
No use	503	35.6	911	64.4	3	833.73**
Early onset (≤13 years)	34	5.3	603	94.7		
Middle onset (14-18 years)	105	4.1	2431	95.9		
Late onset (≥19 years)	8	3.6	212	96.4		
Smoking status						
Current	94	9.9	854	90.1	1	2.65
Never	297	8.3	3303	91.8		

**$p < .001$, two-tailed.

Table 10

Frequency of Missing Values

Variable	Missing		Non-missing	
	n	%	*n*	%
Year of study	109	2.2	4805	97.8
High school connectedness				
I got along well with my teachers.	24	0.5	4890	99.5
I did as little as possible; I just wanted to get by.	22	0.4	4892	99.5
I paid attention to the teachers.	30	0.6	4884	99.3
I was interested in what I was learning in class.	38	0.8	4876	99.2
I felt like an outsider or like I was left out of things at school.	30	0.6	4884	99.4
I had friends at school to whom I could talk about personal things.	30	0.6	4884	99.4
I like to participate in many school activities e.g. clubs, sports, drama.	29	0.6	4885	99.4
People at school were interested in what I had to say.	28	0.6	4886	99.4
Father involvement				
I could count on him to help me out, if I had some kind of problem.	6	0.1	4908	99.9
He kept pushing me to do my best in whatever I did.	10	0.2	4904	99.8

(continued)

Variable	Missing		Non-missing	
	n	%	*n*	%
He kept pushing me to think independently.	30	0.6	4884	99.4
He helped me with my school work if there was something I didn't understand.	24	0.5	4890	99.5
When he wanted me to do something, he explained why.	15	0.3	4899	99.7
Mother involvement				
I could count on her to help me out, if I had some kind of problem.	18	0.4	4896	99.6
She kept pushing me to do my best in whatever I did.	16	0.3	4898	99.7
She kept pushing me to think independently.	36	0.7	4878	99.3
She helped me with my school work if there was something I didn't understand.	28	0.6	4886	99.4
When she wanted me to do something, she explained why.	27	0.5	4887	99.5
Relative age	95	1.9	4819	98.1
Age of alcohol initiation	440	9.0	4474	91.0
Alcohol use	132	2.7	4782	97.3
Age of smoking initiation	38	3.4	1134	96.6

3.3.5 Representativeness of data. For the university sample, in most cases the gender sample was not representative of the population of the institution. As such, sample weights were generated for the Prevalence Study to adjust for differences across gender between the institution-specific sample and each individual university. However, most colleges do not report their gender distributions making it impossible to calculate a sample weighting scheme for the college sample. Because it was unknown as to how representative the sample was to the college population at each college across gender, the college sample could not be weighted. As such, no sample weights were used in this analysis. Therefore, the sample of young adults may or may not be representative of its target population and this may limit its generalizability to the post-secondary population. However, as the focus of this analysis was not to generate population prevalence rates but to examine differences in predictors leading to smoking across university and college students, the use of weighted data were not necessary.

3.3.6 Analytic plan. To answer the research questions posed in this thesis, the following methods were employed.

Question 1: What are the characteristics of smokers and never-smokers attending college and university?

To describe the characteristics of college and university students, first, separate *t*-tests for the college sample and the university sample were run on the continuous level characteristics (age, year of study, family connectedness and high school connectedness). The *t*-test determined significant differences between smokers and never-smokers within school type. Second, to describe the categorical characteristics (gender, living arrangement, relative age and age of onset of alcohol use), crosstabs by smoking status

were run separately for the college sample and the university sample. A chi-square test determined significant differences between current smokers and never-smokers.

Question 2: What are the smoking behaviours of college and university students and do they differ?

a) Smoking Frequency

b) Smoking History (Age of Smoking Initiation, Smoking initiation before or after enrolment)

To compare the smoking behaviours across college and university students, first only current smokers were selected. A crosstab and chi-square test were run on smoking frequency and smoking initiation before or after enrolment by school status (college, university). A *t*-test was also employed to determine the significant differences in age of smoking initiation (in years) by school type (college, university).

Question 3: After controlling for demographic characteristics (age, gender, year of study, and living arrangement), to what extent are personal characteristics differentially related to the smoking status of college and university students? Do the personal characteristics moderate the relationship between school status and smoking status?

To determine if personal characteristics associated with current smoking were statistically different between college and university students, and were moderated by personal characteristics, a series of logistic regression models on the entire sample were run with the dependent variable, current versus never smokers. Table 11 outlined the models used to test the research questions.

In model one, only the demographics were included. In model two, both the demographics and school status (college, university) were included. In model three, the

Table 11

Logistic Models to Test Research Questions

Variable	Model One	Model Two	Model Three	Model Four	Model Five	Model Six	Model Seven	Model Eight
Demographics								
Age								
Gender	X	X	X	X	X	X	X	X
Year of study								
Living arrangement								
School status								
College versus university		X	X	X	X	X	X	X
Personal characteristics								
Relative age			X	X			X	X
Alcohol onset								
Socioenvironmental Influences								
Family connectedness					X	X	X	X
High school connectedness								
Interactions								
School status x relative age				X				X
School status x alcohol use onset								
School status x gender								
Interactions								
School status x family connectedness						X		
School status x high school connectedness								X
School status x gender								

demographics, school status, and personal characteristics were included. In model four, two-way interactions between school status and personal characteristics and between school status and gender were added to the previous model all at once. This step tested for moderation between school and smoking by personal characteristics and by gender. The adequacy of the model was tested using the Hosmer-Lemeshow test of goodness of fit and the Nagelkerke's R-squared value was reported for the strength of the association.

Question 4: After controlling for demographic characteristics (age, gender, year of study, and living arrangement), to what extent are socioenvironmental influences differentially related to the smoking status of college and university students? Do the socioenvironmental influences moderate the relationship between school status and smoking status?

To determine if socioenvironmental influences associated with current smoking were significantly different between college and university students, a series of logistic regression models on the entire sample were run with the dependent variable, current versus never smokers. In model five, demographics, school status, and socioenvironmental influences were included. In model six, the two-way interactions between school status and socioenvironmental influences and between school status and gender were added to the previous model all at once. This step tested for moderation between school and smoking by socioenvironmental influences and by gender. The adequacy of the model was tested using the Hosmer-Lemeshow test of goodness of fit and the Nagelkerke's R-squared value was reported for the strength of the association.

Question 5: After controlling for demographic characteristics (age, gender, year of study, and living arrangement), to what extent are personal characteristics and

socioenvironmental influences differentially related to the smoking status of college and university students? Do personal characteristics and socioenvironmental influences moderate the effect of school status and smoking status?

To determine if personal characteristics and socioenvironmental influences were significantly different between college and university students, the following models were examined. Model seven included demographics, school status, personal characteristics and socioenvironmental influences. In model eight, two-way interactions between school status and personal characteristics, school status and socioenvironmental influences, and school status and gender were added to the previous model all at once. This tested for moderation of personal characteristics, socioenvironmental influences, and gender on school and smoking. The adequacy of the model was tested using the Hosmer-Lemeshow test of goodness of fit and the Nagelkerke's R-squared value was reported for the strength of the association.

Chapter 4: Results

In the final sample of 757 college and 4,157 university students (aged 17-24 years), 69.5% were female and 30.5% were male; their average age was 20.1 years; and 23.1% ($N = 1,134$) were current smokers. In the college sample, 37% of students smoked and in the university sample, 21% of students smoked. The college sample included a significantly greater proportion of smokers (37.0%) than the university sample (20.5%), $\chi^2(1, N = 1,134) = 97.6, p < .001$.

The characteristics of college smokers and never smokers and university smokers and never-smokers are displayed in tables 12-15, respectively. Among college students, smoking status was associated with age and living arrangement. Compared to never smokers, college smokers were older and a greater than expected number lived off-campus. Smoking status was also associated with age of onset of alcohol use for college students. There was a lower than expected number of non-users and late users of alcohol who were current smokers and a higher than expected number of early users who were current smokers. Among university students, smoking status was associated with: age, gender, year of study, family connectedness and high school connectedness. University smokers were older than never-smokers, in a higher year of study and were also more likely to be male. Compared to never-smokers, university smokers also experienced greater family connectedness and lower high-school connectedness. Smoking status was also associated with living off-campus and age of onset of alcohol use. There was a lower than expected number of current smokers living on-campus and a higher than expected number living off-campus. Among current university smokers, there was a much lower

Table 12

Association between Demographic and Personal Characteristics of College Smokers and Never-smokers (N=757)

Variable	Current Smokers ($n = 280$)			Never Smokers ($n = 477$)			*df*	χ^2
	n	%	*z resid.*	*n*	%	*z resid.*		
Demographics								
Gender								
Female	190	38.2	0.4	308	61.8	-0.3	1	0.85
Male	90	34.7	-0.6	169	65.3	0.5		
Living arrangement								
On-campus	33	35.1	-0.3	61	64.9	0.2	2	6.83*
Off-campus	136	42.2	1.5	186	57.8	-1.2		
Family home	111	32.6	-1.3	230	67.4	1.0		
Single parent								
Yes	28	35.4	-0.2	51	64.6	0.1	1	0.09
No	252	37.2	0.2	426	62.8	0.0		
Personal characteristics								
Relative age								
1st quartile (Jan –Mar)	78	40.6	0.8	114	59.4	-0.6	3	3.29

(continued)

Variable	Current Smokers ($n = 280$)			Never Smokers ($n = 477$)			*df*	χ^2
	n	%	*z resid.*	*n*	%	*z resid.*		
2nd quartile (Apr – Jun)	77	37.0	0.0	131	63.0	0.0		
3rd quartile (Jul – Sep)	59	31.9	-1.1	126	68.1	0.9		
4th quartile (Oct – Dec)	66	38.4	0.3	106	61.6	-0.2		
Alcohol onset								
No use	28	19.6	-3.4	115	80.4	2.6	3	49.25**
Early onset (≤13 years)	84	54.2	3.5	71	45.8	-2.7		
Middle onset (14-18 years)	165	38.6	0.6	262	61.4	-0.4		
Late onset (≥19 years)	3	9.4	-2.6	29	90.6	2.0		

*$p < .05$. **$p < .001$. Two-tailed.

Table 13

Mean Differences of Demographic and Socioenvironmental Influences of College Current and Never-smokers (N =757)

Variable	Current Smokers (n = 280)		Never Smokers (n = 477)		t (755)
	M	*SD*	*M*	*SD*	
Demographics					
Age	20.08	1.60	19.70	1.50	3.23**
Year of study	1.61	0.72	1.69	0.78	-1.48
Socioenvironmental influences					
Family connectedness	5.56	1.56	5.50	1.45	0.48
High school connectedness	26.73	2.76	26.91	2.74	-0.84

*p <.05. **p <.001. Two-tailed.

Note. Family Connectedness was an average score created by summing a total of 10 items with response options 0-2. Scores ranged from 0-10 where higher scores represented more quality family connectedness. High school connectedness consisted of 8 questions on a 5-point Likert scale. Scores ranged from 8-40 where higher scores represented greater high school connectedness.

Table 14

Demographic and Personal Characteristics of University Smokers and Never-smokers (N=4,157)

Variable	Current Smokers (n = 854)			Never Smokers (n = 3,303)			*df*	χ^2
	n	%	*z resid.*	*n*	%	*z resid.*		
Demographics								
Gender								
Female	566	19.4	-1.4	2351	80.6	0.7	1	7.56*
Male	288	23.2	2.1	952	76.8	-1.1		
Living arrangement								
On-campus	143	14.9	-3.9	818	85.1	2.0	2	31.64**
Off-campus	521	23.5	3.1	1695	76.5	-1.6		
Family home	190	19.4	-0.8	790	80.6	0.4		
Single parent								
Yes	54	21.7	0.4	195	78.3	-0.2	1	0.21
No	800	20.5	-0.1	3108	79.5	0.1		
Personal characteristics								
Relative age								
1st quartile (Jan –Mar)	228	22.6	1.5	779	77.4	-0.7	3	7.05

(continued)

Variable	Current Smokers (n = 854)			Never Smokers (n = 3,303)			df	χ^2
	n	%	*z resid.*	n	%	*z resid.*		
2nd quartile (Apr – Jun)	201	18.1	-1.8	910	81.9	0.9		
3rd quartile (Jul – Sep)	223	21.2	0.4	831	78.8	-0.2		
4th quartile (Oct – Dec)	202	20.5	0.0	783	79.5	0.0		
Alcohol onset								
No use	53	6.1	-9.4	813	93.9	4.8	3	298.51**
Early onset (≤13 years)	249	40.3	10.8	369	59.7	-5.5		
Middle onset (14-18 years)	544	22.1	1.7	1916	77.9	-0.9		
Late onset (≥19 years)	8	3.8	-5.4	205	96.2	2.7		

*p <.05. **p <.001. Two-tailed.

Table 15

Mean Differences of Demographic and Socioenvironmental Influences of University Current and Never-Smokers (N = 4,157)

Variable	Current Smokers (n = 854)		Never Smokers (n = 3,303)		*df*	*t*
	M	*SD*	*M*	*SD*		
Demographics						
Age	20.33	1.59	20.03	1.57	4155.00	4.87**
Year of study	2.59	1.12	2.50	1.10	4155.00	2.10*
Socioenvironmental influences						
Family connectedness	5.65	1.47	5.42	1.33	1239.67	4.15**
High school connectedness	29.15	4.12	32.14	4.42	1404.22	-18.65**

*p <.05. **p <.001. Two-tailed.

Note. Family Connectedness was an average score created by summing a total of 10 items with response options 0-2. Scores ranged from 0-10 where higher scores represented more quality family connectedness. High school connectedness consisted of 8 questions on a 5-point Likert scale. Scores ranged from 8-40 where higher scores represented greater high school connectedness.

than expected number of non-users and late users of alcohol and a much higher than expected number of early users of alcohol.

The smoking behaviours of college and university students are outlined in Table 16. Smoking frequency and smoking before or after enrolment were both associated with schooling. A higher than expected proportion of college smokers' smoke every day and a lower than expected proportion smoke once or twice altogether or not all during the past 30 days. Among university smokers, there was a lower than expected proportion who smoked every day. College smokers were also less likely to start smoking after they enrolled in post-secondary studies. In addition, there was also a significant effect of age of smoking initiation, t (1132) = 3.65, p <.001, with college students starting earlier (M = 14.86 years, SD = 2.34) than university students (M = 15.47 years, SD = 2.46).

Next, a series of logistic regressions were completed to examine the specified relationships between smoking status (current smoker versus never-smoker) and school status, demographic variables, personal characteristics and socioenvironmental influences. With the exception of the variable used to flag family type (single parent versus two-parent family) and variables applicable only to smokers (i.e., smoking frequency, age of initiation, smoking before or after enrolment), all other variables were at least marginally related to smoking status for either or both college and university students. Hence, all variables were entered into the logistic regression analyses in accordance with the research questions. Family type (single parent) was entered for statistical control purposes; variables applicable to only smokers were not entered. The models presented in the tables include the regression coefficients (b), the odds ratios (OR)

Table 16

Smoking Behaviours of College and University Students (N = 1,134)

Variable	College ($n = 280$)			University ($n = 854$)			*df*	χ^2
	n	%	*z resid.*	*n*	%	*z resid.*		
Smoking frequency								
Every day	137	48.9	3.7	267	31.3	-2.1	4	31.63**
Almost every day	32	11.4	-0.3	105	12.3	0.2		
On some days each week	36	12.9	-1.0	135	15.8	0.5		
Once or twice altogether	64	22.9	-2.2	277	32.4	1.3		
Not at all	11	3.9	-2.0	70	8.2	1.2		
Began smoking after enrolment								
Yes	19	6.8	-3.1	137	16.0	1.8		15.23**
No	261	93.2	1.3	717	84.0	-0.7		

*$p < .05$. **$p < .001$. Two-tailed.

Note. Smoking frequency was based on a question that asked about past 30 day use of tobacco.

and the 95% confidence intervals (95% CI). When interactions are included, only the *b*'s are reported and interpreted. When a *b* is significant, this indicates that either a one-unit increase in the independent variable or for a categorical variable, the significant category compared to the reference, influences the odds of being a current smoker (compared to never smoker). When a significant interaction occurs, this indicates that a one-unit change in the independent variable or significant category compared to a reference category, influences the odds of being a current smoker but to varying degrees for college and university students. To interpret the varying degrees of change for college and university, both the main effect *b*'s and the interaction effect *b*'s were used. For continuous level interactions with school status, logits were calculated for the mean and for the mean plus or minus the standard deviation. For categorical level interactions, logits were calculated using each of the categories. These values were then graphed and compared for college and university. The graphed logits represent the magnitude of change in the log odds; that is, the odds ratio will change by a factor (logit) as one-unit increase in a continuous level variable or between a categorical variable and a reference.

For all logistic regression models, relevant assumptions were tested and met. Because these logistic regression models were built to test specified research questions, all models are presented. The eight models tested are presented below.

Table 17 presented the logistic regression models one and two. In these models, demographic variables and school status were included to determine the independent effects of each on smoking status. A shown, all models had adequate fit, but explained relatively little variance in smoking status.

Table 17

Logistic Regression Models One and Two Predicting Current Smoking with Demographics and School Status (N = 4,914)

Variable	Model One			Model Two		
	b	*OR*	95% CI	*b*	*OR*	95% CI
Constant	-6.51	0.001	--	-5.68	0.003	--
Demographics						
Age	0.26	1.30	[1.22, 1.39]	0.21	1.24	[1.16, 1.32]
Gender						
Male	0.12	1.13	[0.98, 1.30]	0.12	1.12	[0.97, 1.30]
Female	--	--	--	--	--	--
Year of study	-0.42	0.65	[0.60, 0.72]	-0.28	0.76	[0.68, 0.84]
Living arrangement						
On-campus	-0.39	0.68	[0.54, 0.84]	-0.22	0.80	[0.64, 1.00]
Off-campus	0.24	1.27	[1.08, 1.50]	0.29	1.34	[1.14, 1.58]
Family home	--	--	--	--	--	--
Single parent						
Yes	0.04	1.05	[0.80, 1.36]	0.004	1.00	[0.77, 1.31]
No	--	--	--	--	--	--
School status						

(continued)

Variable	Model One			Model Two		
	b	*OR*	95% CI	*b*	*OR*	95% CI
College	--	--	--	0.65	1.91	[1.58, 2.30]
University	--	--	--	--	--	--
Model Fitting Information						
Nagelkerke's R-square		0.04			0.05	
Hosmer and Lemeshow χ^2		13.62			7.26	

$^{*}p < .05$. $^{**}p < .001$. Two-tailed.

Note. Year of study was standardized for the separate institutional types by multiplying by its mean and dividing by its standard deviation.

In model one, age, year of study and living off-campus compared to a family home were significant predictors of current smoking for young adults. As age increases, the odds of current smoking increase. As year of study increases, the odds of smoking decrease. Living on-campus compared to a family home was associated with lower odds of current smoking. Living off-campus compared to a family home was associated with increased odds of current smoking. Model two showed that, controlling for demographics, young adults at college were more likely to be current smokers compared to university.

Table 18 presented the logistic regression models three and four. These models included the addition of personal characteristics and interactions between school status and personal characteristics to see the relative effects of personal characteristics while adjusting for school status and demographics, as well as to determine any differential effects across school status. As shown, these models had adequate fit and explained more variance in smoking status than models one and two.

In model three, relative age and age of onset of alcohol use were included with the demographic variables and school status. Age of onset of alcohol use was a significant predictor of current smoking but relative age was not. Early and middle onset of alcohol use compared to no use was associated with eight-fold and four-fold greater odds of current smoking respectively. Late onset of alcohol use was associated with decreased odds of current smoking compared to no use. Note that the number of cases in the late onset category was quite small and may make this an unstable estimate.

Model four included demographic variables, school status, and personal characteristics, as well as the interactions between school status and personal

Table 18

Logistic Regression Models Three and Four Predicting Current Smoking with Demographics, School Status & Personal Characteristics (N=4,914)

Variable	Model Three			Model Four		
	b	*OR*	95% CI	*b*	*OR*	95% CI
Constant	-7.05	0.001	--	-7.18	0.001	--
Demographics						
Age	0.23	1.25	[1.17, 1.34]	0.22	1.25	[1.17, 1.34]
Gender						
Male	0.14	1.15	[0.99, 1.34]	0.21	--	[1.04, 1.45]
Female	--	--	--	--	--	--
Year of study	-0.28	0.76	[0.68, 0.84]	-0.27	0.76	[0.68, 0.85]
Living arrangement						
On-campus	-0.25	0.78	[0.61, 0.98]	-0.26	0.77	[0.61, 0.98]
Off-campus	0.17	1.18	[1.00, 1.40]	0.16	1.18	[0.99, 1.40]
Family home	--	--	--	--	--	--
Single parent						
Yes	0.001	1.00	[0.76, 1.32]	-0.003	1.00	[0.75, 1.32]
No	--	--	--	--	--	--
School status						

(continued)

Variable	Model Three			Model Four		
	b	*OR*	95 % CI	*b*	*OR*	95 % CI
College	0.62	1.86	[1.53, 2.27]	1.25	--	[1.87, 6.52]
University	--	--	--	--	--	--
Personal characteristics						
Relative age						
1st quartile (Jan –Mar)	0.08	1.08	[0.89, 1.32]	0.07	--	[0.86, 1.34]
2nd quartile (Apr – Jun)	-0.16	0.86	[0.70, 1.05]	-0.20	--	[0.65, 1.03]
3rd quartile (Jul – Sep)	-0.03	0.97	[0.80, 1.19]	0.03	--	[0.82, 1.29]
4th quartile (Oct – Dec)	--	--	--	--	--	--
Alcohol onset						
Early onset (≤13 years)	2.10	8.17	[6.22, 10.73]	2.28	--	[7.09, 13.54]
Middle onset (14-18 years)	1.30	3.65	[2.86, 4.67]	1.43	--	[3.12, 5.63]
Late onset (≥19 years)	-0.74	0.48	[0.25, 0.92]	-0.64	--	[0.25, 1.13]
No use	--	--	--	--	--	--
Interactions						
School status x relative age						
School x 1st quartile	--	--	--	0.03	--	[0.63, 1.70]
School x 2nd quartile	--	--	--	0.20	--	[0.75, 2.01]

(continued)

Variable	Model Three			Model Four		
	b	*OR*	95 % CI	*b*	*OR*	95 % CI
School x 3rd quartile	--	--		-0.29	--	[0.45, 1.25]
School status x alcohol onset						
School x early onset	--	--		-0.72	--	[0.26, 0.91]
School x middle onset	--	--		-0.54	--	[0.34, 1.02]
School x late onset	--	--		-0.35	--	[0.16, 3.10]
School status x gender	--	--		-0.33	--	[0.50, 1.05]
Model Fitting Information						
Nagelkerke's R-square	0.16			0.16		
Hosmer and Lemeshow χ^2	5.42			3.88		

$^{*}p < .05$. $^{**}p < .001$. Two-tailed.

Note. Year of study was standardized for the separate institutional types by multiplying by its mean and dividing by its standard deviation. When interactions were included in the model, only the regression coefficients were reported and interpreted.

characteristics and school status and gender. The interaction between age of onset of alcohol use and school status was significant indicating that the effect of age of onset of alcohol use on the odds of being a current smoker was dependent upon whether young adults were college or university students.

Table 19 presented the logistic regression models five and six. In these models, socioenvironmental influences were included to test their relative effects on smoking status without personal characteristics. Interactions were also included in model six to test whether there were differential effects across school status. As shown, according to the Hosmer and Lemeshow χ^2, these models did not have adequate fit and explained slightly less variance in smoking status than models three and four. Because models five and six did not have adequate fit, the results for these models will not be interpreted. To determine why these models did not have adequate fit, additional models were run with family connectedness and the school type by family connectedness interaction (without high school connectedness) and high school connectedness and the school type by high school connectedness interaction (without family connectedness). These models are presented in Appendix A.

Table 20 presented the logistic models seven and eight. These were the final models that included demographics, school status, personal characteristics and socioenvironmental influences as well as all of the interactions. These models examined the effects of personal characteristics and socioenvironmental influences when they were further adjusted for each other. As shown, these models had adequate fit and explained the most variance in smoking status out of all the models. In model seven, age, year of study and living off-campus compared to a family home increased the odds of current

Table 19

Logistic Regression Models Five and Six Predicting Current Smoking with Demographics, School Status & Socioenvironmental Influences (N = 4,914)

Variable	Model Five			Model Six		
	b	*OR*	95% CI	*b*	*OR*	95% CI
Constant	-1.52	0.22	--	-1.07	0.34	--
Demographics						
Age	0.19	1.21	[1.13, 1.30]	0.18	1.20	[1.12, 1.29]
Gender						
Male	-0.05	0.95	[0.82, 1.10]	-0.03	--	[0.82, 1.15]
Female	--	--	--	--	--	--
Year of study	-0.26	0.77	[0.69, 0.85]	-0.25	0.78	[0.70, 0.86]
Living arrangement						
On-campus	-0.15	0.86	[0.68, 1.08]	-0.16	0.85	[0.68, 1.08]
Off-campus	0.36	1.43	[1.21, 1.70]	0.35	1.42	[1.20, 1.68]
Family home	--	--	--	--	--	--
Single parent						
Yes	0.12	1.13	[0.82, 1.54]	0.13	1.14	[0.83, 1.56]
No	--	--	--	--	--	--

(continued)

Variable	Model Five			Model Six		
	b	*OR*	95% CI	*b*	*OR*	95% CI
School Status						
College	0.14	1.15	[0.94, 1.40]	-2.70	--	[0.01, 0.40]
University	--	--	--	--	--	--
Socioenvironmental influences						
Family connectedness	0.06	1.06	[1.00, 1.12]	-0.06	--	[1.01, 1.13]
High school connectedness	-0.13	0.88	[0.86, 0.89]	-0.14	--	[0.85, 0.88]
Interactions						
School x family connectedness	--	--	--	-0.02	--	[0.88, 1.10]
School x high school connectedness	--	--	--	0.11	--	[1.05, 1.18]
School x gender	--	--	--	-0.11	--	[0.62, 1.29]
Model Fitting Information						
Nagelkerke R-square		0.13			0.13	
Hosmer and Lemeshow χ^2		48.72**			30.81**	

*$p < .05$. **$p < .001$. Two-tailed.

Note. Year of study was standardized for the separate institutional types by multiplying by its mean and dividing by its standard deviation. Family Connectedness was an average score created by summing a total of 10 items with response options 0-2. Scores ranged from 0-10 where higher scores represented more quality family connectedness. High school connectedness consisted of 8 questions on a 5-point Likert scale. Scores ranged from 8-40 where higher scores represented greater high school connectedness. When interactions were included in the model, only the regression coefficients were reported and interpreted.

Table 20

Logistic Regression Models Seven and Eight Predicting Current Smoking with Demographics, School Status, Personal Characteristics & Socioenvironmental Influences (N = 4,914)

Variable	Model Seven			Model Eight		
	b	*OR*	95% CI	*b*	*OR*	95% CI
Constant	-2.77	0.063	--	-2.47	0.085	--
Demographics						
Age	0.21	1.23	[1.15, 1.32]	0.20	1.22	[1.14, 1.31]
Gender						
Male	-0.03	0.97	[0.83, 1.13]	-0.02	--	[0.82, 1.17]
Female	--	--	--		--	--
Year of study	-0.27	0.77	[0.69, 0.85]	-0.26	0.77	[0.69, 0.86]
Living arrangement						
On-campus	-0.19	0.83	[0.65, 1.06]	-0.19	0.83	[0.65, 1.06]
Off-campus	0.23	1.26	[1.06, 1.51]	0.23	1.25	[1.05, 1.50]
Family home	--	--	--	--	--	--
Single parent						
Yes	0.05	1.05	[0.76, 1.47]	0.06	1.07	[0.76, 1.49]
No	--	--	--	--	--	--
School status						

(continued)

Variable	Model Seven			Model Eight		
	b	*OR*	95% CI	*b*	*OR*	95% CI
College	0.09	1.10	[0.89, 1.35]	-2.13	--	[0.02, 0.79]
University	--	--	--	--	--	--
Personal characteristics						
Relative age						
1st quartile (Jan –Mar)	0.16	1.18	[0.96, 1.45]	0.17	--	[0.94, 1.50]
2nd quartile (Apr – Jun)	-0.08	0.93	[0.75, 1.14]	-0.10	--	[0.71, 1.15]
3rd quartile (Jul – Sep)	0.01	1.01	[0.82, 1.25]	0.07	--	[0.85, 1.36]
4th quartile (Oct – Dec)	--	--	--	--	--	--
Alcohol onset						
Early onset (≤13 years)	2.15	8.56	[6.47, 11.33]	2.35	--	[7.50, 14.64]
Middle onset (14-18 years)	1.39	4.00	[3.11, 5.15]	1.55	--	[3.49, 6.41]
Late onset (≥19 years)	-0.69	0.50	[0.26, 0.98]	-0.59	--	[0.26, 1.22]
No use	--	--	--	--	--	--
Socioenvironmental influences						
Family connectedness	0.05	1.05	[0.99, 1.11]	0.05	--	[0.99, 1.12]
High school connectedness	-0.14	0.87	[0.85, 0.89]	-0.15	--	[0.84, 0.88]
Interactions						

(continued)

Variable	Model Seven			Model Eight		
	b	*OR*	95% CI	*b*	*OR*	95% CI
School status x relative age						
School x 1st quartile	--	--	--	-0.05	--	[0.58, 1.58]
School x 2nd quartile	--	--	--	0.12	--	[0.68, 1.85]
School x 3rd quartile	--	--	--	-0.32	--	[0.43, 1.22]
School status x alcohol onset	--	--				
School x early onset	--	--	--	-0.79	--	[0.24, 0.85]
School x middle onset	--	--	--	-0.65	--	[0.30, 0.91]
School x late onset	--	--	--	-0.38	--	[0.16, 3.04]
School status x family connectedness	--	--	--	-0.02	--	[0.87, 1.10]
School status x high school connectedness	--	--	--	-0.11	--	[1.05, 1.19]
School Status x gender	--	--	--	-0.10	--	[0.62, 1.32]
Model Fitting Information						
Nagelkerke's R-square	0.23			0.23		
Hosmer and Lemeshow χ^2	12.07			11.69		

$^{*}p < .05$. $^{**}p < .001$. Two-tailed.

Note. Year of study was standardized for the separate institutional types by multiplying by its mean and dividing by its standard deviation. Family Connectedness was an average score created by summing a total of 10 items with response options 0 and 1. Scores ranged from 0-10 where higher scores represented greater family connectedness. High school connectedness consisted of 8 questions on a 5-point Likert scale. Scores ranged from 8-40 where higher scores represented greater high school connectedness. When interactions were included in the model, only the regression coefficients were reported and interpreted.

smoking. Controlling for demographics and school status, age of onset of alcohol use, and high school connectedness were also significant predictors of current smoking. Early and middle onset of alcohol use compared to no use was associated with the greater odds of current smoking. Late onset of alcohol use compared to no use was associated with the lower odds of current smoking, but again, the number of cases in this category was low, and as a result this may be an unstable estimate. As levels of high school connectedness increase, the likelihood of smoking decreases. School status was non-significant in this model and does not appear to be a significant predictor of current smoking when the socioenvironmental variables were included in the model.

In model eight, interactions between school status and personal characteristics, school status and socioenvironmental variables and school status and gender were added to the model. School status and age of onset of alcohol use and school status and high school connectedness were significant interactions. The interaction between age of onset of alcohol use and school status indicated that the effect of age of onset of alcohol use on the likelihood of current smoking was dependent upon whether young adults were from college versus university. As depicted in Figure 4, when the model was further adjusted for high school and family connectedness, the log odds of current smoking for university students compared to college students was greater ($b = 2.35$ versus $b = -0.57$). In other words, university students who started drinking early were at a greater risk of current smoking than college students who started drinking early, after adjusting for high school and family connectedness. Even among students who started drinking between the ages of 14-18

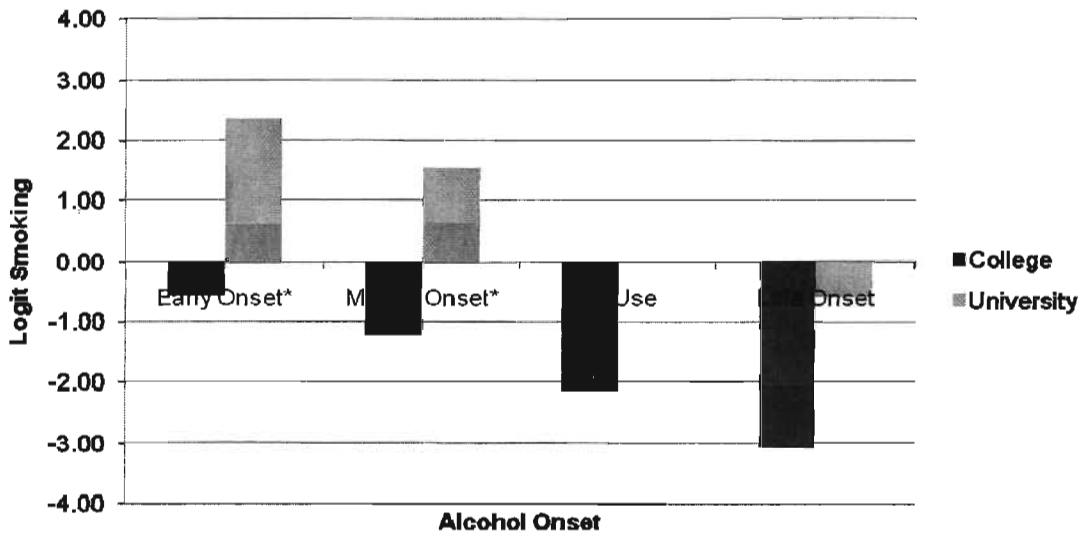

Figure 4. Model Eight Interaction between School Status and Age of Onset of Alcohol Use

$^{*}p < .05$.

Note. Alcohol onset reference category = no use; school status reference category= university

years (middle onset), university students were at a greater risk of smoking than college students (b = 1.55 versus b = -1.22). When all variables were included in the model, the interaction between high school connectedness and school status indicated that the relationship between high school connectedness and the likelihood of current smoking differed for young adults in college versus university. As depicted in Figure 5, as levels of high school connectedness increased for university students, the log odds of current smoking decreased (b = -4.05 versus b = -5.41). For college students, high school connectedness had little influence on the likelihood of current smoking.

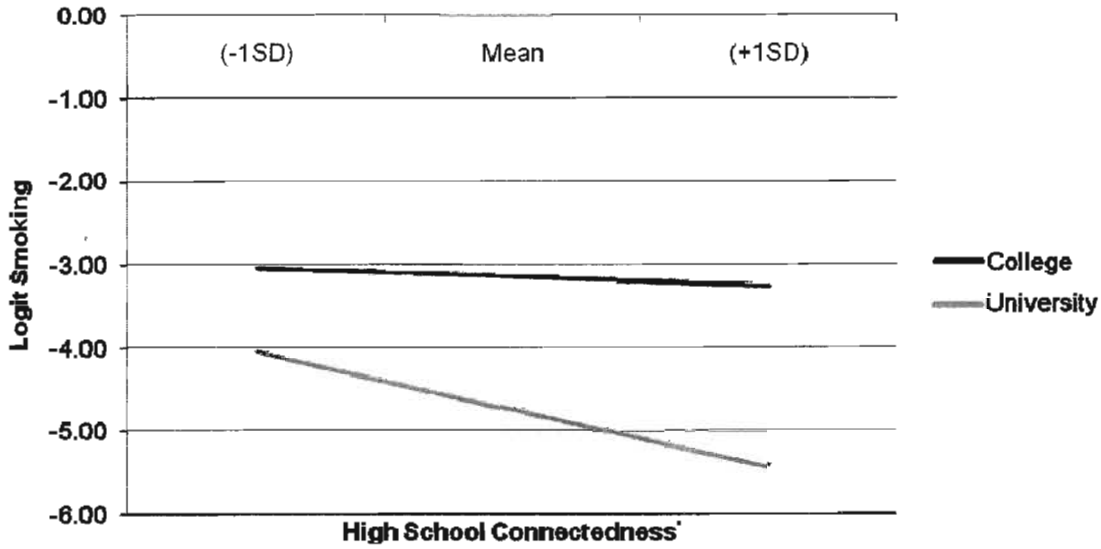

Figure 5. Model Eight Interaction between School Status and High School Connectedness

* $p < .05$.

Chapter 5: Discussion

Research addressing young adults' tobacco use has largely ignored the heterogeneity of the young adult population, despite the well-established associations among education, SES and smoking. There is evidence that college students come from families with lower SES compared to university students yet there are no published Canadian studies comparing the smoking patterns of college and university students. Furthermore, despite evidence that educational pathways and tobacco use share some of the same personal and socioenvironmental influences, there are no Canadian studies addressing whether and how these factors are differentially associated with the smoking participation of college and university students. Therefore, this is one of the first Canadian studies to examine the correlates of tobacco use among young adults at college and university. This study is based on the assumption that some of the same personal and socioenvironmental correlates that are associated with tobacco use are also associated with educational pathway (from high school to either college or university). Of interest was the degree to which these variables were associated with tobacco use, and whether the association differed for college and university students.

5.1 Smoking Behaviours of College and University Students

Although this sample of young adult students is likely not completely representative of college and university students in Ontario, it is nonetheless interesting to note that a much greater proportion of college students (37%) than university students (21%) were current smokers. Also noteworthy were the findings that almost half of the college students smoked daily, whereas less than one-third of the university students did so, and the finding that college students commenced smoking almost a year earlier than

university students. These results are quite consistent with previous literature showing that there are more smokers (Sanem, Berg, An, Kirch & Lust, 2009) and more daily smokers (James, Chen & Sheu, 2007) among students in two-year institutions compared to students in four-year institutions.

The higher proportion of smoking among college students compared to university students may suggest that the pathway to university may be more protective against smoking for young adults. The protective effect of the university pathway may reflect the established SES-smoking relationship where higher levels of SES are associated with less smoking. Higher levels of SES coincide with skills and assets that influence lifestyle choices which include positive attitudes toward health, health-related knowledge, greater access to health services and the association with individuals who promote healthy behaviours (Winkleby et al., 1992). Since there is evidence that college students often come from families of low SES (Shaienks et al., 2008; Usher, 2005), it is not surprising then that more college students smoke. College-bound students may have less health literacy, less resources to cope with stress and they may have been raised in an environment where smoking is less stigmatized. University-bound students as a result of their family origin may have higher levels of health literacy and lower levels of stress. In addition, university bound students may have resources to help them cope with stress rather than engaging in negative health behaviours such as smoking.

The results of this thesis help to support the argument that individual and socioenvironmental "third" variables are associated with both the smoking participation and educational pathways chosen by young adults. Even though young adults are still in the process of "attaining" their post-secondary education, differences in smoking

prevalence, rates, and initiation-timing are apparent. Indeed, the pattern of differences that emerged between college and university students in this study consistently supported the argument that variations in smoking participation across education and SES levels are apparent before education is complete and SES is established.

One of the differences between college and university smokers was that, among university students, smokers differed from never-smokers on many more variables than was the case for college students. Specifically, among university students, current smokers were more likely than never-smokers to be male; they were also older than never-smokers. Compared to never-smokers, greater proportions of current smokers lived off campus, first drank alcohol at a very early age, and were in a later year of study. Current smokers also had higher levels of family connectedness, and lower levels of high school connectedness than never smokers. Among college students on the other hand, current smokers differed from never-smokers only in terms of being older, and being more likely to live off campus and to first drink alcohol at a very early age. Unfortunately, it is very difficult to explain why there were many more differences between university smokers and never-smokers and fewer differences between college smokers and never-smokers. Perhaps, the predictors of smoking used in this study (personal and socioenvironmental factors) were more relevant for the university sample and not the college sample. This likely could have occurred since the predictors of smoking were drawn from the literature and most of the literature is based on university students. This possibility is further supported by the results of the logistic regressions which showed significant interactions between level of schooling (college versus university) and some of the personal and socioenvironmental variables. As discussed

below, these significant interactions most often showed the variable's association with smoking status fluctuating more for university students than college students. In any case, this pattern of results suggests that young adult students represent a heterogeneous population for which predictors of smoking may differ according to educational pathway.

In addition to the differences observed in the characteristics of current and never-smokers, college and university students also differed in their smoking histories. Despite the greater proportion of smoking among college students, it is interesting to note that far more university students (16%) than college students (7%) began smoking after starting their post-secondary studies. The fact that university students are starting to smoke later than college students and more often after enrolment, suggests that there may be something about the transition to university, but not college, which triggers the uptake and escalation of smoking. There is evidence from previous research that this escalation of smoking may be attributable to the social environment of the university. For example, Gilpin and colleagues (2005a) have found that smoking often escalates in social settings such as bars, clubs, and parties. University students are more likely than college students to move into on-campus housing when they transition from high school to post-secondary. Living on-campus provides more opportunities for socializing in ways that are linked to escalation of smoking and it also requires significant adaption to new social networks, living arrangements and expectations. The demands of such adaptation have been associated with smoking initiation and escalation (Gfroerer et al., 1997).

Overall, the varying smoking patterns among young adults at both college and university are troubling for the following reasons. First, the higher levels of smoking among college students reflects the well-documented distribution of smoking across

socioeconomic strata and might suggest that college-educated individuals will bear a heavier burden than university-educated individuals in terms of health care costs and loss of productivity. Second, the low level smoking pattern among university students has the potential to result in negative consequences. These negative consequences could include the escalation of tobacco use and a lower desire to quit. The escalation of tobacco use could be a result of transitioning and adapting to the demands of school (Gfroerer et al., 1997) as well as the social context of university (Colder et al., 2008; Colder et al., 2006; Gilpin et al., 2005a). Young adults who are low level smokers have reported a lower desire to quit (Moran et al., 2004). Both the increased use of tobacco and lower desire to quit suggest that university students will continue their smoking well into their adulthood.

5.2 Factors Related to Educational Pathway and Tobacco Use

The results from the descriptive analyses signify that among college students, tobacco use can be described as so: College students begin smoking at a relatively early age; most progress to regular smoking; and smokers are quite similar to never-smokers apart from being older and beginning to drink alcohol at an earlier age. On the other hand, the descriptive results for university students suggest that their smoking is more malleable and dependent upon personal factors and socioenvironmental context. University students who smoke display many different patterns of consumption, from regular to sporadic smoking. They begin smoking later, and are susceptible to starting smoking upon the transition to post-secondary. Overall the discrepancies between university students' and college students' patterns of smoking suggest that the risk-enhancing/risk-protective qualities of certain individual, family, and school experiences may be more associated with the smoking status of university students rather than college

students. To examine how the personal and social influences experienced during adolescence differentially affected the smoking status of students at college and university; a number of logistic regression analyses were conducted. Models which included main effects, as well as interactions for the personal and socioenvironmental variables under investigation shed light on the differential impact of these variables on the smoking status of college and university students.

5.2.1 Association between personal characteristics and smoking status. Age of onset of alcohol use persisted as a predictor of smoking status after controlling for demographics, school status, and other personal and socioenvironmental factors. The main effect, which showed that very-early and moderately-early initiation of alcohol use were both associated with higher odds of smoking, was qualified by a significant interaction between school-type and age of onset of alcohol use. The interaction showed that early use of alcohol (compared to non-use) elevated the risk of smoking to a greater degree for university students than for college students. This suggests that initiation of alcohol use in the early-to-mid teens is a risk factor for smoking for both university and college students—but more so for university than college students. While a past study has shown that an early onset of drinking is associated with an increased likelihood of tobacco use (LaBrie et al., 2007), this study has only investigated university students. The current study, by comparing college and university students, shows how much greater a risk early use of alcohol is for university students compared to college students. In both cases, early onset of drinking in adolescence may predispose young adults to socialize in ways that involve drinking. The strong pairing of drinking and smoking may then facilitate the initiation, continuation and escalation of smoking (Harrison, Desai &

McKee, 2008; Lewinsohn et al., 1999; Weitzman & Chen, 2005). However, features of the university setting and the transition to university may magnify students' susceptibility to smoking. Compared to colleges, universities offer greater access to campus pubs and residence parties which offer more opportunities for drinking and smoking, and more on-campus housing which is associated with increased odds of smoking. Furthermore, the transition to university may require greater social and personal changes and induce added stress, all of which have been linked to alcohol and tobacco use (Arnett, 2005; Gfroerer et al., 1997; Schulenberg et al., 1994; Schulenberg & Maggs, 2002). Together, these contextual issues may explain why early onset of alcohol use puts university students at an even greater risk of smoking than college students.

Students' relative age (i.e., whether they were born in the first or the second half of the year) was not related to current smoking for either college or university students, nor was it a significant predictor of current smoking in any of the logistic regression models. Even though relative age has been related to educational pathway and educational pathway may be related to whether or not students smoke, in this study there is no evidence to suggest that relative age is associated with tobacco use. Although it has been shown that students who have a younger relative age have had poor academic performance (Gledhill et al., 2002; Russell & Startup, 1986), a younger relative age in this young adult population appears to have no effect on tobacco use. Instead, it may be that earlier pubertal development instead of a younger relative age that is a critical factor in the onset and subsequent use of alcohol, drugs, and tobacco (Dick et al., 2000; Hayatbakhsh et al., 2008).

5.2.2 Association between socioenvironmental variables and smoking status.

Based on research showing that greater levels of family connectedness and school connectedness during adolescence are protective against negative health behaviours such as tobacco use (Nutbeam et al., 1993; Resnick et al., 1997), this study examined whether post-secondary students who reported feeling more accepted and valued in their family and at their high school would be less likely to smoke. Bivariate analyses revealed that, among university students, connectedness to high school was significantly lower and family connectedness slightly higher for current smokers than never-smokers. For college students there were no such differences observed. Results of the logistic regression analysis that included demographic, school status, personal factors and socioenvironmental influences revealed that high school connectedness but not family connectedness was associated with smoking status, such that students who felt more connected to their high school were less likely to be current smokers. Conversely, it is possible that university students who were current smokers had low high school connectedness as a result of their smoking in adolescence. When the interaction effects were included in the model, it was determined that university students' odds of smoking were much higher for those reporting lower levels of high school connectedness. The odds of current smoking for college students did not vary that much, suggesting that high school connectedness was not associated with college students' smoking status. This finding suggests that feeling connected to high school is more protective against smoking for university students than for college students. The stronger relationship between connectedness and tobacco use for university students is consistent with previous studies showing that: high school students who were university-bound are more likely to report

feeling connected and more likely to participate in intramurals and sports than their college-bound peers (King & Warren, 2006); participation in extracurricular activities such as sports and after school clubs is negatively associated with cigarette use (Lisha & Sussman, 2009); and students who are more academically engaged (often a sign of connectedness) are more likely to go to university (Lambert et al., 2004).

Students' self-reported level of family connectedness was not related to current smoking for either college or university students, as it was not a significant predictor of current smoking in the logistic regression models. Although it has been shown that greater levels of family connectedness are associated with improved academic performance (Hara & Burke, 1998; Jeynes, 2005) and less smoking (Miller & Volk, 2002), the current study offered no evidence that family connectedness was associated with tobacco use for either college or university students.

5.2.3 Association between gender and smoking status. It is interesting that gender did not emerge as a significant predictor of tobacco use in any of the logistic regression models. Past studies of young adult students have found that gender is associated with tobacco use (Johnston, O'Malley & Bachman; Morrell, Cohen, Bacchi & West, 2005; Moskal, Dzuiban & West, 1999; Rigotti, Lee & Wechsler, 2000; Sanem et al., 2009; Thompson et al., 2007). The lack of a significant association between gender and smoking for college and university students may be because the sample included both college and university students and past research has almost exclusively focused on university students. If there were gender differences in the smoking status of college and university students, then the interaction of school type by gender should have been significant. This would suggest that either this result is inconsistent or reflects a reliable

lack of association between gender and the smoking status of college and university students.

5.3 Implications

5.3.1 Clinical implications. The current high prevalence of smoking among young adults reported in the literature (CTUMS, 2008) and observed in this convenience sample of young adult college and university students underscores the need for effective smoking prevention and cessation interventions for young adult students. Furthermore, results of this study speak against the implicit assumption that tobacco control programming for college students can be developed using empirical evidence obtained from university samples. The results of this study clearly illustrate that college and university students experience different levels of risk for smoking and thus need different tobacco programming. Finally, the robustness of school status (i.e., college versus university) as a predictor of tobacco use and the findings that personal and socioenvironmental factors were differentially associated with college and university students' smoking participation all confirm that tobacco control interventions should be tailored differently for college and for university students.

First, health professionals and administrators on college campuses should be advised to avoid using data from studies of university students as evidence on which they make their programming decisions. College health professionals need to be aware that interventions that are based on the premise that post-secondary students are relatively new smokers and/or social smokers may not apply as well to the college population as they do to the university population. This is because college smokers, unlike university smokers, have been smoking a lot longer and are heavier consumers of tobacco. In

addition, college health professionals also need to be aware that for college students, compared to university students, there are fewer differences between current and never smokers in terms of their demographic, personal and socioenvironmental factors. This means that at colleges, smokers do not look that different from never-smokers except that they are a bit older and more likely to live off-campus (not in a family home). It is recommended that tobacco-related information and resources are offered and conveniently available to students who live off-campus. Programming at colleges should also address the fact that smoking is a long-standing, habitual behaviour.

To this end, conventional cessation services offered in campus health settings by medical and para-medical professionals would likely be beneficial at assisting college smokers to quit. These interventions are known to effectively address the needs of regular smokers (Fiore et al., 2008). Reaching off-campus smokers with cessation programs and education may require colleges to consider implementing the types of outreach health promotion programming that is often seen on university campuses. Given that more smoking participation was observed for students living off campus (compared to in the family home), there should be a greater emphasis on reaching students. Finally, findings that similar and substantial proportions of male (34.7%) and female (38.2%) college students smoke, suggest that programming at colleges must exist for both males and females.

An important implication of the current results for university tobacco control programming is the need for university administrators and health professionals to recognize that the transition from high school to university will trigger smoking uptake and/or escalation for a number of students. To reduce smoking on university campuses,

campus interventions should address the transition from high school to university. Addressing the transition period to university, campus administrators and health professionals must be prepared to help students cope with the stress involved with adapting to a new environment since this stress can often lead to the escalation of smoking (Gfroerer et al., 1997). In addition to being prepared to help students cope with transitioning to school, additional health promotion campaigns that target young adults who are university-bound may be needed. These health promotion campaigns could educate university-bound students about the services and information offered to them once they are on-campus. Tobacco control programming on university campuses (as compared to college campuses) should also place a greater emphasis on the social context of students' smoking. While conventional clinical cessation counselling should be available to those students who are daily smokers, universities need to address the fact that more university students are less-than-daily smokers. The goals of these interventions would be to prevent the escalation of smoking and to promote smoking cessation. Finally, tobacco control programming on university campuses should place a greater emphasis on targeting students who live off-campus and create resources that are targeted towards male students who are in a greater year of study.

In addition to suggesting that tobacco control programming is required for college and university smokers, the results of this study indicate that this programming needs to start during adolescence. The fact that the variables examined in this study represented experiences that occurred well before young adulthood and are likely to be associated with educational pathway as well as tobacco use, suggests that optimal tobacco control interventions to reduce the prevalence of smoking in young adulthood should actually

begin in adolescence or even earlier. These interventions would address college-bound and university-bound students in unique ways. For example, as shown here and elsewhere (King & Warren, 2006; Lambert et al., 2004), students who go on to college generally experience less connectedness in high school than their peers who go on to university. Given that high school connectedness was found to be protective against smoking for university students, but not for college students, it is not surprising that more college students smoke. The low levels of high school connectedness experienced by college students in this study may speak to the need to specifically address college-bound students' feelings of school connectedness. Doing so may not only reduce their risk of smoking, but have the additional benefit of improving their academic performance (since connectedness is related to performance [Lambert et al., 2004] and pathway [King et al., 2006]).

Like high school connectedness, age of onset of alcohol use was related to smoking for both college and university students. This study revealed that post-secondary students who first drink alcohol at a very young age (less than 13 years) or a moderately young age (14-18 years) are at an increased risk for smoking, with the risk being higher for university students than for college students. These findings, combined with the evidence that alcohol and tobacco use are often concurrent behaviours among youth and young adults (Dierker et al., 2006; Leatherdale and Ahmed, 2010; Nichter et al., 2006; Paglia-Boak, Mann, Adlaf & Rehm, 2009; Schmid et al., 2007) suggest that to reduce tobacco use among young adult students, prevention efforts need to address the early use of alcohol. Furthermore, given that this current study, like previous research (Kandel & Logan, 1984; Yamaguchi & Kandel, 1984; Reed, Wang, Shillington, Clap & Lange,

2007) suggests that alcohol use is initiated slightly before or around the same time as tobacco use, strategies to delay alcohol use could deter smoking.

5.3.2 Socio-political implications. As evident from the results in this study, college and university students represent two distinct populations in terms of both their smoking participation and the factors that are associated with their tobacco use. The differences in smoking participation and factors that were associated with their tobacco use may be reflective of the relationship between SES and smoking. There is existing literature that suggests that the SES of college students and their families is generally lower than that of university students and their families (Shaienks et al., 2008; Usher, 2005). Together, these data imply that we will continue to see a higher smoking prevalence among populations with lower SES to the extent that college graduates end up in lower SES positions compared to university graduates. This higher smoking prevalence among low SES groups will allow tobacco-related health disparities to persist. These health disparities may continue unless we target adolescents before they make their educational pathway to college or university and their smoking is established.

To this end, it is suggested that effective, tailored programs among the different population of students (college and university) are required. Given that most comprehensive programs are centered toward targeting students who are generally homogeneous, these types of programs may not be the most successful to reduce the smoking prevalence among young adults at college and university. Tailored programs will address the heterogeneity of the young adult population. In particular, tailored programs for college students should target college student's heavier smoking behaviours and offer effective strategies for cessation. Tailored programs for university students

should address less-than-daily smoking as well as offer effective strategies for cessation. In addition to these programs, the findings also suggest very specific interventions for adolescents including school engagement programs and early alcohol prevention. Each of these tailored interventions could be a part of an overall strategy to reduce the high smoking prevalence among the young adult population and to help decrease the SES-related health disparities.

5.4 Limitations

There were a number of limitations to the study design and methodology that must be addressed. First, defining "late onset of alcohol use" as first consuming alcohol at age 19 or older made it so participants 17-18 years old *who had not yet consumed alcohol* could not be by definition "late" starters. Instead they were identified as non-users. Given the relatively large number of 17 and 18 year-olds in the sample, this could explain the low number of participants classified as having late onset use of alcohol. The low number of respondents, who were classified as having started alcohol after the age of 19 years, may have made the odds ratio for late onset versus no use unstable. This right censoring of age of onset of alcohol use variable could have also made the observed interactions between school status and age of onset of alcohol use unstable in the logistic regression models. Therefore, the comparisons made between the onset of alcohol use and school status should be taken with caution.

Second, the external generalizability of the study was limited because it used a convenience sample of young adults. Although the sample may or may not be representative of its target population, the focus of this analysis was to examine the differences in the predictors of current smoking across college and university students (in

which case a convenience sample is sufficient to use). In addition to using a convenience sample, the low response rate of this survey affected the generalizability of these results. The low response rate may have occurred because of students' lack of access of computers, students not using their school e-mail accounts and the nature of the survey topic. The response rate was similar to a previous web-based survey response rate of 13% for post-secondary samples (Morrell et al., 2005). However, both response rates have been lower than what other previous researchers have found (Cranford et al., 2008; McCabe et al., 2006; Pealer et al., 2008). The low response rate may indicate that the sample was not representative of the target population and could have been biased. Since only a small percentage of young adults responded, it may suggest that there was something different about the responders compared to non-responders.

Third, there were constraints of performing an analysis of secondary data based on the availability of particular measures on the survey. For example, the family connectedness variable was based on questions that asked about the quality of interaction and support that respondents perceived their parents had offered during high school. Perhaps these questions were not relevant to these young adults and could explain the large number of missing cases. Also, a variable was constructed representing young adults who were from single parent families. While this variable was constructed from the family connectedness items, it may not accurately code all students from single or two parent households. This potential miscoding may be a result of students answering the questions incorrectly or not answering the questions because they did not feel that the questions were applicable to their parental figures.

Fourth, the data from respondents was clustered in the educational institutions (specific colleges or universities). This can often lead to the correlation of data within institutions and the underestimation of standard errors around model estimates. Therefore as a result, smoking may have been more common among certain institutions in the sample. This limitation could have been statistically overcome by including the institution name in the model. However, this approach was not done in the thesis due to ethical considerations.

5.4.1 Sample size. The sample size of university students was substantially greater than the sample size of college students; however, the college sample itself was not small. Given that colleges in Ontario are generally smaller in population size than universities, the smaller sample size of college students in this study could have been proportional to the college student population in which the sample was drawn. Unfortunately, data on the institution population size and institution-specific response rates were not available. Next, there is the possibility that there were more statistically significant findings among the university sample because of the larger sample size. To determine if similar findings would be found in the college sample if the sample size was larger, the effects among the college sample were examined. It was found that the pattern of results was not similar to the university sample and had lower levels of significances. This may suggest that a larger sample size would not produce the same significant findings as found in the university sample and that the sample size that was used in this study was likely sufficient.

Finally, the proportion of cases lost for analysis from the college sample was also greater than the proportion of cases lost in the university sample. There were also

significant differences between cases lost and retained for both the college and university sample. As a result, there could have been a systematic bias introduced into the sample. Cases that were deemed lost in both the college and university sample were different from cases retained; they were more likely to be from a two-parented families and to be non-users of alcohol. In the university sample however, lost cases were also younger, in a lower year of study and were more likely to live in a family home. The characteristics that lost cases shared between the college and university sample (two-parented family and non-users of alcohol) likely would not result in differences across groups since any systematic bias would be the same. However, because the cases lost in the university sample were also younger, in a lower year of study and more likely to live in a family home, it may suggest that these students did not find the questionnaire relevant. Since age, year of study and living arrangement were associated with current smoking (current smokers were older, in higher year of study and lived off-campus) in the university sample, the cases that were dropped could have been non-smokers. This could have resulted in a higher proportion of smokers in the university sample and may have exaggerated the associations within university looking at current versus never smokers. If there was a greater number of smokers who responded in the university sample, it could have also exaggerated the associations found between the variables and school status (i.e., the greater associations found for age of onset of alcohol use and high school connectedness for university students compared to college students). Therefore, the results of this thesis should be taken with caution.

5.5 Strengths

Notwithstanding these limitations, there were a number of strengths to acknowledge for this study. First, of great importance, it was the first known Canadian study to compare college and university students in their predictors of smoking behaviour. From a health professional and programming perspective, this is important because both tobacco use programming and counselling are based on evidence from research. Developing programs and offering support based on research that is completed on other populations is likely to be very ineffective. Therefore, to provide the best care and programming that is targeted towards young adults at colleges and universities in Canada, evidence from a study that includes both college and university students should be used.

Second, this study examined a range of correlates beyond the typical demographic characteristics that have been investigated in the past. For example, in one of the only other studies that has compared the smoking behaviours of students at two- year and four-year institutions, Sanem and colleagues (2009) limited their investigation to age, gender, ethnicity, marital status, and hours worked per week. This thesis investigated variables that were not only related to tobacco use but were also related to educational pathway. Given that a range of both personal and social factors are related to both tobacco use and educational pathway, it was important to include relevant variables that were identified in the literature in order to explain and understand the institutional differences in smoking.

Third, this study used a sample of young adults who were screened to capture the typical emerging young adult. This strengthened the study because it allowed for a more equal comparison between college and university. These students would likely also have

their experiences from adolescence available for recall. This would limit the possibility of other factors affecting their smoking status such as being married and having already completed a degree.

Although there was both a low response rate and inability to weight the sample, data was collected from multiple institutions in Ontario. The sampled areas included multiple institutions so that the results could be applied to a wider population.

5.6 Future Research

The purpose of this thesis was to compare the differential smoking behaviours of college and university students by factors that were associated with both educational pathway and smoking. Although the purpose of this thesis was achieved, more research on college students is warranted. This is partially due to the lack of research on college students in general, and because the predictors examined in this thesis appear to have been more relevant for university students. Although it is difficult to determine which predictors may be more relevant for college students since the paucity of data on college students, future studies of college students may want to consider examining other SES-related predictors for college students. Examples of predictors may include occupational status (i.e., part-time employed versus full-time employed), program of study (i.e., trades versus professional programs) as well as factors such as stress and other mental health areas (i.e., depression and anxiety).

Since there is a paucity of research on college students in Canada, there should be many more research projects that involve college students from multiple campuses. Since college participation in this study appeared to be quite low, it may suggest that in future studies, effective strategies to increase enrolment in research will need to be applied.

Also, given that college students were significantly more likely to be unselected and have cases dropped from the study, perhaps using different surveys for college and university students would increase the sample size. However, the lower number of college students that participated may have been an institutional effect and may suggest that we need more efficient ways of approaching colleges and their students to participate in research. As a result of the missing values on some variables, it is suggested that methods for increasing responses to all the questions on the questionnaire should be implemented. This may include re-wording of questions, providing more prompts and using different survey methods. If studies are either online or paper-and-pencil methods, strategies to increase response rates should be employed in order to ensure the greatest number of people respond and a more representative sample can be drawn.

Since this sample could not be weighted, inferences about the smoking prevalence on college and university campuses in Ontario could not be made. Therefore, future research that uses a representative sample could provide the opportunity to make comparisons between the smoking prevalence of college and university students.

Since low-level smoking was common among university students, and previous studies have found that smoking is associated with the social environment (Moran et al., 2004), perhaps, another analysis could look at multiple categories of smoking rather than only current smoking versus never smoking. This would include a multinomial logistic regression approach with possible categories of daily, social and never smoking. This would be able to tell us if indeed university students are more likely to be social smokers compared to college students and identify the factors that are associated with each type of smoking pattern. It should be noted that this approach was not used in this thesis because

of the reduced sample size (i.e., college sample) after applying the screening procedure. The low number of cases in the study would make the comparisons between multiple categories of the dependent variable very unstable.

5.7 Conclusion

With the aim of curbing the high smoking prevalence among young adults, a greater understanding of smoking was required. In order to do so, this thesis addressed the heterogeneity of the young adult population by examining both students who enter college and university. This examination has shown that the patterns of smoking uptake and participation for college versus university students are manifested differently and differentially associated with personal and socioenvironmental factors. Based on the findings in this thesis, tobacco control programmers need to be aware that programs should be tailored specifically to college students and university students separately. These preventive programs should address both the early use of alcohol and subsequent use of tobacco, as well as encourage greater school engagement. Programs that are tailored specifically to college students will need to take into consideration that students have had a longer, habitual smoking trajectory and for university students address the transition to university.

Of key importance, this was the first known study in Canada to examine both college and university students in their smoking patterns. As a result, it is hoped that this research will both fulfill the programming needs for college and university students, and will set the way for future research conducted on college and university students.

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Appendix A:

Table A1

Means of Continuous-level Variables (N = 4,914)

Variable	Total		College		University	
	M	*SD*	*M*	*SD*	*M*	*SD*
Age	20.06	1.57	19.84	1.55	20.09	1.58
Year of study	0.23	1.10	1.66	0.76	2.52	1.11
Family connectedness	5.48	1.38	5.52	1.49	5.47	1.36
High school connectedness	30.81	4.62	26.84	2.74	31.53	4.52

Note. Family Connectedness was an average score created by summing a total of 10 items with response options 0-2. Scores ranged from 0-10 where higher scores represented more quality family connectedness. High school connectedness consisted of 8 questions on a 5-point Likert scale. Scores ranged from 8-40 where higher scores represented greater high school connectedness. Year of study was standardized for the total sample.

Table A2

Summary of Correlations between Continuous-level Variables (N = 4,914)

Variable	1	2	3	4
Age	—	0.76**	0.00	-0.03
Year of study	0.76**	—	-0.02	0.09**
Family connectedness	0.00	-0.02	—	-0.13**
High school connectedness	-0.03	0.09**	-0.13**	—

*$p < .05$. **$p < .01$.

Note. Family Connectedness was an average score created by summing a total of 10 items with response options 0-2. Scores ranged from 0-10 where higher scores represented more quality family connectedness. High school connectedness consisted of 8 questions on a 5-point Likert scale. Scores ranged from 8-40 where higher scores represented greater high school connectedness.

Table A3

Logistic Regression Models Five and Six Predicting Current Smoking with Demographics, School Status & Family Connectedness (N = 4,914)

Variable	Model Five [a]			Model Six [a]		
	b	*OR*	95% CI	*b*	*OR*	95% CI
Constant	-6.32	0.002	--	-6.36	0.002	--
Demographics						
Age	0.21	1.23	[1.15, 1.31]	0.21	1.23	[1.15, 1.31]
Gender						
Male	0.10	1.11	[0.96, 1.28]	0.10	1.11	[0.96, 1.28]
Female	--	--	--	--	--	--
Year of study	-0.27	0.76	[0.69, 0.84]	-0.27	0.76	[0.69, 0.85]
Living arrangement						
On-campus	-0.22	0.80	[0.64, 1.01]	-0.22	0.81	[0.64, 1.01]
Off-campus	0.30	1.35	[1.15, 1.60]	0.31	1.36	[1.15, 1.60]
Family home	--	--	--	--	--	--
Single parent						
Yes	0.36	1.43	[1.05, 1.95]	0.34	1.41	[1.03, 1.92]
No	--	--	--	--	--	--
School status						

(continued)

Variable	Model Five [a]			Model Six [a]		
	B	*OR*	95% CI	*B*	*OR*	95% CI
College	0.63	1.88	[1.56, 2.28]	1.02	--	[1.43, 5.42]
University	--	--	--	--	--	--
Socioenvironmental influences						
Family connectedness	0.13	1.14	[1.08, 1.20]	0.14	--	[1.09, 1.23]
Interactions						
School x Family connectedness	--	--	--	-0.07	--	[0.83, 1.05]
Model Fitting Information						
Nagelkerke's R-square		0.06			0.06	
Hosmer and Lemeshow χ^2		6.00			5.46	

$^{*}p < .05$. $^{**}p < .001$. Two-tailed.

Note. Year of study was standardized for the separate institutional types by multiplying by its mean and dividing by its standard deviation. Family Connectedness was an average score created by summing a total of 10 items with response options 0-2. Scores ranged from 0-10 where higher scores represented more quality family connectedness. When interactions were included in the model, only the regression coefficients were reported and interpreted.

[a] Models five and six were examined without high school connectedness to determine the effect of family connectedness on smoking and the adequacy of the model (without high school connectedness).

Table A4

Logistic Regression Models Five and Six Predicting Current Smoking with Demographics, School Status & High School Connectedness (N = 4,914)

Variable	Model Five [b]			Model Six [b]		
	b	*OR*	95% CI	*b*	*OR*	95% CI
Constant	-1.13	0.32	--	-0.65	0.52	--
Demographics						
Age	0.19	1.21	[1.14, 1.30]	0.19	1.20	[1.13, 1.29]
Gender						
Male	-0.05	0.95	[0.82, 1.10]	-0.06	0.95	[0.81, 1.10]
Female	--	--	--	--	--	--
Year of study	-0.27	0.77	[0.69, 0.85]	-0.26	0.77	[0.70, 0.86]
Living arrangement						
On-campus	-0.15	0.86	[0.68, 1.08]	-0.16	0.86	[0.68, 1.08]
Off-campus	0.36	1.43	[1.21, 1.69]	0.35	1.42	[1.20, 1.68]
Family home	--	--	--	--	--	--
Single parent						
Yes	-0.04	0.96	[0.73, 1.26]	-0.03	0.97	[0.74, 1.28]
No	--	--	--	--	--	--
School status						

(continued)

Variable	Model Five [b]			Model Six [b]		
	b	*OR*	95% CI	*B*	*OR*	95% CI
College	0.13	1.14	[0.93, 1.40]	-2.86	--	[0.01, 0.28]
University	--	--	--	--	--	--
Socioenvironmental influences						
High school connectedness	-0.14	0.87	[0.86, 0.89]	-0.15	--	[0.85, 0.88]
Interactions						
School x High school connectedness	--	--	--	0.11	--	[1.06, 1.18]
Model Fitting Information						
Nagelkerke's R-square		0.13			0.13	
Hosmer and Lemeshow χ^2		41.47**			25.64**	

*p <.05. **p <.001. Two-tailed.

Note. Year of study was standardized for the separate institutional types by multiplying by its mean and dividing by its standard deviation. High school connectedness consisted of 8 questions on a 5-point Likert scale. Scores ranged from 8-40 where higher scores represented greater high school connectedness. When interactions were included in the model, only the regression coefficients were reported and interpreted.

[b] Models five and six were examined without family connectedness to determine the effect of high school connectedness on smoking and the adequacy of the model (without family connectedness).

Appendix B:

B. 1 Analysis Conducted on First Imputed Dataset

The following analyses were completed using the first imputed sample. In this first sample all variables (including complete missing scores for mother and father involvement) were imputed. Figure B1 presents the sample screening procedure when both mother and father involvement scores were imputed. Because there were significant differences between participants with and without valid parental involvement scores, the individuals with complete missing scores for both mother and father involvement questions (missing on every question) were removed from the sample (n = 441). Tables B1-B2 present the differences between participants with and without valid scores on the parental involvement questions. Participants differed in the following: age, year of study, living arrangement, and age of onset of alcohol use. Participants who were missing all the family involvement scores were younger, in a lower year of study, and a greater than expected number lived in a family home whereas a lower than expected number lived off-campus. Also, a greater than expected number of cases with missing values for all parental involvement questions had not used alcohol, and a lower than expected number had used alcohol early before the age of 18 years. Table B3 shows that a greater proportion of college cases were unselected in the first sample of 5,348 cases. Table B4 outlines the missing values on all the variables. Tables B5 – B13, present the analysis for each of the research questions on the first sample.

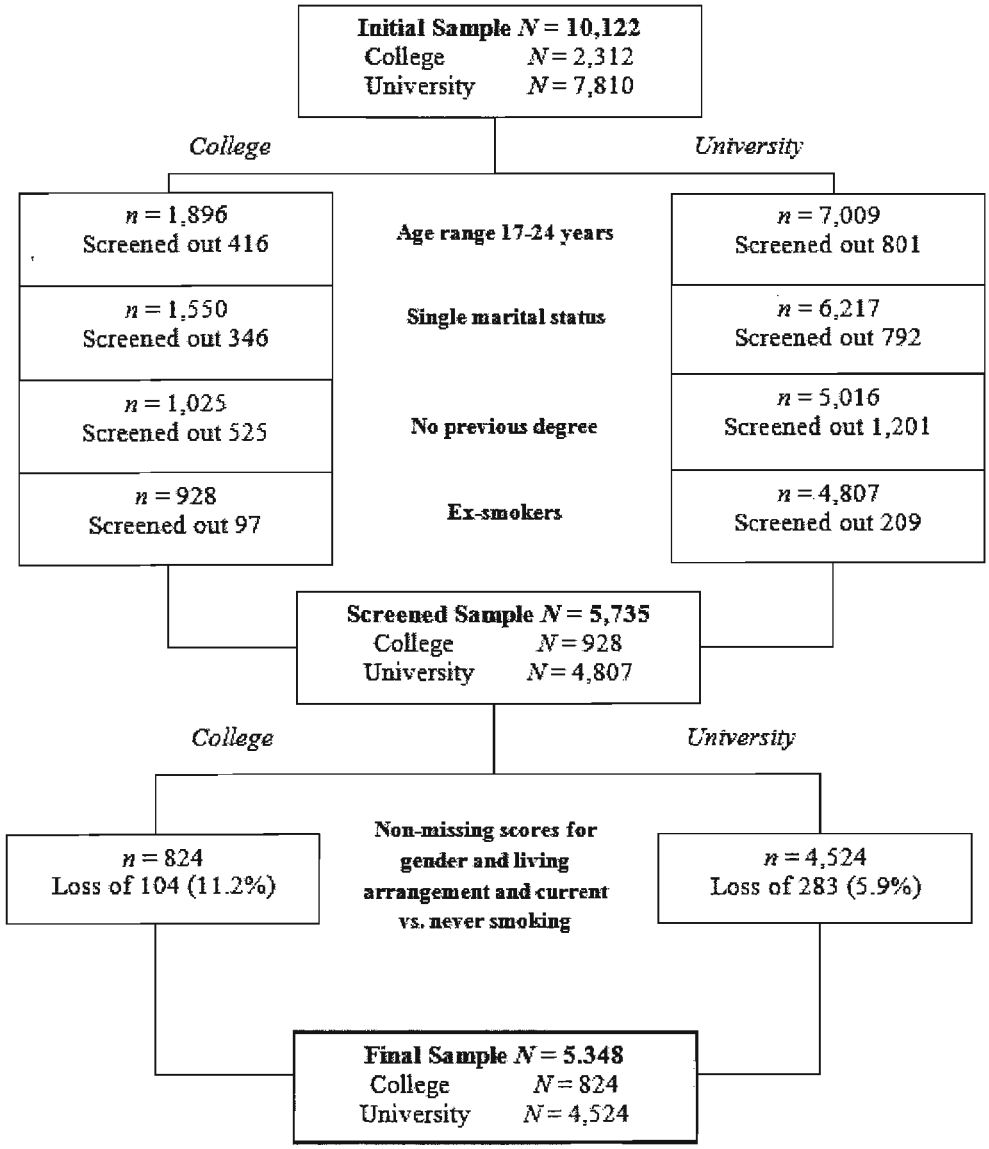

Figure B1. Procedure Applied to Select Sample (version 1)

Table B1

Mean Differences between Participants with and Without Family Involvement Scores

Variable	Missing Family Scores ($n = 441$)		Complete Family Scores ($n = 4,907$)		*df*	*t*
	M	*SD*	*M*	*SD*		
Age	19.87	1.55	20.06	1.58	5346	2.42*
Year of study	0.11	1.13	0.26	1.11	5224	2.66*
High school connectedness	30.74	4.35	30.80	4.63	5250	0.26

* $p < .05$.

Note. Year of study was standardized because both college and university students were included in the sample. High school connectedness consisted of 8 questions on a 5-point Likert scale. Scores ranged from 8-40 where higher scores represented greater high school connectedness.

Table B2

Characteristics of Participants with and Without Family Involvement Scores (N =5,348)

Variable	Complete Family Scores ($n = 4,907$)			Missing Family Scores ($n = 441$)			*df*	χ^2
	n	%	*z resid*	*n*	%	*z resid*		
Gender								
Female	3409	91.5	0.5	316	8.5	-0.2	1	0.91
Male	1498	92.3	-0.8	125	7.7	0.2		
Living arrangement								
On-campus	1054	90.8	1.2	107	9.2	-0.3	2	11.51*
Off-campus	2534	93.0	-2.2	191	7.0	0.7		
Family home	1319	90.2	2.0	143	9.8	-0.6		
School status								
College	757	91.9	-0.1	67	8.1	-0.1	1	0.02
University	4150	91.7	0.0	374	8.3	0.0		
Smoking status								
Current	1134	90.8	1.2	115	9.2	-0.4	1	1.99
Never	3773	92.0	-0.7	326	8.0	0.2		
Relative age								

(continued)

Variable	Missing Family Scores (n =441)			Complete Family Scores (n = 4,907)			*df*	χ^2
	n	%	*z resid*	*n*	%	*z resid*		
1st quartile (Jan –Mar)	1193	90.1	2.1	131	9.9	-0.6	3	6.99
2nd quartile (Apr – Jun)	1229	91.8	0.0	110	8.2	0.0		
3rd quartile (Jul – Sep)	1233	92.6	-1.0	99	7.4	0.3		
4th quartile (Oct – Dec)	1157	92.6	-1.0	93	7.4	0.3		
Alcohol onset								
No use	1059	74.0	23.5	373	26.0	-7.0	3	820.14**
Early onset (≤13 years)	754	98.0	-6.1	15	2.0	1.8		
Middle onset (14-18 years)	2850	98.2	-12.0	53	1.8	3.6		
Late onset (≥19 years)	244	100.0	-4.5	0	0.0	1.3		

* p <.05. ** p < .001. Two-tailed.

Table B3

Association between School Status and Missing Cases from Screened to Final Sample in First Sample (N = 5,348)

School Status	Selected Cases		Unselected Cases		χ^2
	n	%	*n*	%	
College	824	88.8	104	11.2	
University	4524	94.1	283	5.9	34.98**
Total	5348	93.3	387	6.7	

**$p < .001$.

Table B4

Frequency of Missing Values in First Sample (N = 5,348)

Variable	Missing		Non-missing	
	n	%	*n*	%
Year of study	122	2.3	5226	97.7
High school connectedness				
I got along well with my teachers.	28	0.5	5320	99.5
I did as little as possible; I just wanted to get by.	26	0.5	5322	99.5
I paid attention to the teachers.	35	0.7	5313	99.3
I was interested in what I was learning in class.	44	0.8	5304	99.2
I felt like an outsider or like I was left out of things at school.	34	0.6	5314	99.4
I had friends at school to whom I could talk about personal things.	35	0.7	5313	99.3
I like to participate in many school activities e.g. clubs, sports, drama.	33	0.6	5315	99.4
People at school were interested in what I had to say.	33	0.6	5315	99.4
Father involvement				
I could count on him to help me out, if I had some kind of problem.	440	8.2	4908	91.8
He kept pushing me to do my best in whatever I did.	444	8.3	4904	91.7
He kept pushing me to think independently.	464	8.7	4884	91.3
He helped me with my school work if there was something I didn't understand.	458	8.6	4890	91.4
When he wanted me to do something, he explained why.	449	8.4	4899	91.6
Mother involvement				
I could count on her to help me out, if I had some kind of problem.	452	8.5	4896	91.5

(continued)

Variable	Missing		Non-missing	
	n	%	*n*	%
She kept pushing me to think independently.	470	8.8	4878	91.2
She helped me with my school work if there was something I didn't understand.	462	8.6	4886	91.4
When she wanted me to do something, she explained why.	461	8.6	4887	91.4
Relative age	103	1.9	5245	98.1
Age of alcohol initiation	38	0.9	4323	99.1
Alcohol use	494	9.2	4854	90.8
Age of smoking initiation	49	3.9	1200	96.1

Table B5

Association between Demographic and Personal Characteristics of College Smokers and Never-smokers in First Sample (N = 824)

Variable	Current Smokers (n = 308)			Never Smokers (n = 516)			*df*	χ^2
	n	%	*z resid.*	*n*	%	*z resid.*		
Demographics								
Gender								
Female	209	38.4	0.4	335	61.6	-0.3	1	0.74
Male	99	35.4	-0.6	181	64.6	0.4		
Living arrangement								
On-campus	35	35.7	-0.3	63	64.3	0.2	2	8.86*
Off-campus	155	42.9	1.7	206	57.1	-1.3		
Family home	118	32.3	-1.6	247	67.7	1.2		
Single parent								
Yes	28	35.4	-0.3	51	64.6	0.2	1	0.14
No	280	37.6	0.1	465	62.4	0.0		
Personal characteristics								
Relative age								
1st quartile (Jan –Mar)	86	41.3	0.9	122	58.7	-0.7	3	3.60

(continued)

Variable	Current Smokers ($n = 308$)			Never Smokers ($n = 516$)			*df*	χ^2
	n	%	*z resid.*	*n*	%	*z resid.*		
2nd quartile (Apr – Jun)	82	37.3	0.0	138	62.7	0.0		
3rd quartile (Jul – Sep)	68	32.5	-1.1	141	67.5	0.9		
4th quartile (Oct – Dec)	72	38.5	0.3	115	61.5	-0.2		
Alcohol onset								
No use	51	26.0	-2.6	145	74.0	2.0	3	40.60**
Early onset (≤13 years)	85	54.1	3.4	72	45.9	-2.7		
Middle onset (14-18 years)	169	38.5	0.4	270	61.5	-0.3		
Late onset (≥19 years)	3	9.4	-2.6	29	90.6	2.0		

*$p < .05$. **$p < .001$. Two-tailed.

Table B6

Mean Differences of Demographic and Socioenvironmental Influences of College Current and Never-smokers in First Sample (N =824)

Variable	Current Smokers (n = 308)		Never Smokers (n = 516)		t (822)
	M	*SD*	*M*	*SD*	
Demographics					
Age	20.07	1.61	19.72	1.51	3.17*
Year of study	1.61	0.74	1.70	0.78	-1.71
Socioenvironmental influences					
Family connectedness	5.56	1.49	5.51	1.40	0.47
High school connectedness	26.85	2.75	26.90	2.73	-0.25

*p <.05. **p <.001. Two-tailed.

Note. Family Connectedness was an average score created by summing a total of 10 items with response options 0-2. Scores ranged from 0-10 where higher scores represented more quality family connectedness. High school connectedness consisted of 8 questions on a 5-point Likert scale. Scores ranged from 8-40 where higher scores represented greater high school connectedness.

Table B7

Association between Demographic and Personal Characteristics of University Smokers and Never-smokers in First Sample (N = 4,524)

Variable	Current Smokers (n = 941)			Never Smokers (n = 3,583)			*df*	χ^2
	n	%	*z resid.*	*n*	%	*z resid.*		
Demographics								
Gender								
Female	630	19.8	-1.2	2551	80.2	0.6	1	6.44*
Male	311	23.2	1.9	1032	76.8	-1.0		
Living arrangement								
On-campus	160	15.1	-4.1	903	84.9	2.0	2	34.47**
Off-campus	562	23.8	3.2	1802	76.2	-1.6		
Family home	219	20.0	-0.6	878	80.0	0.3		
Single parent								
Yes	54	21.7	-0.2	195	78.3	0.3	1	0.13
No	887	20.7	0.0	3388	79.3	0.0		
Personal characteristics								
Relative age								

(continued)

Variable	Current Smokers (n = 941)			Never Smokers (n = 3,583)			df	χ^2
	n	%	*z resid.*	n	%	*z resid.*		
1st quartile (Jan –Mar)	254	22.8	1.4	862	77.2	-0.7	3	10.35*
2nd quartile (Apr – Jun)	212	18.0	-2.1	967	82.0	1.1		
3rd quartile (Jul – Sep)	261	22.4	1.2	905	77.6	-0.6		
4th quartile (Oct – Dec)	214	20.1	-0.5	849	79.9	0.2		
Alcohol onset								
No use	125	10.6	-7.7	1059	89.4	4.0	3	268.92**
Early onset (≤13 years)	256	41.1	11.0	363	58.9	-5.7		
Middle onset (14-18 years)	555	22.1	1.4	1957	77.9	-0.7		
Late onset (≥19 years)	8	3.8	-5.4	204	96.2	2.8		

*p <.05. **p <.001. Two-tailed.

Table B8

Mean Differences of Demographic and Socioenvironmental Influences of University Current and Never-Smokers in First Sample (N = 4,524)

Variable	Current Smokers (n = 941)		Never Smokers (n = 3,583)		df	t
	M	SD	M	SD		
Demographics						
Age	20.32	1.60	20.01	1.56	1448.82	5.24**
Year of study	2.57	1.13	2.48	1.11	4522	2.14*
Socioenvironmental influences						
Family connectedness	5.64	1.40	5.42	1.28	1379.71	4.26**
High school connectedness	29.16	4.10	32.13	4.40	1557.49	-19.42**

*p <.05. **p <.001. Two-tailed.

Note. Family Connectedness was an average score created by summing a total of 10 items with response options 0-2. Scores ranged from 0-10 where higher scores represented more quality family connectedness. High school connectedness consisted of 8 questions on a 5-point Likert scale. Scores ranged from 8-40 where higher scores represented greater high school connectedness.

Table B9

Smoking Behaviours of College and University Students in First Sample (N = 1,249)

Variable	College ($n = 308$)			University ($n = 941$)			*df*	χ^2
	n	%	*z resid.*	*n*	%	*z resid.*		
Smoking frequency								
Every day	150	48.7	4.0	291	30.9	-2.3	4	37.02**
Almost every day	37	12.0	-0.1	116	12.3	0.1		
On some days each week	42	13.6	-0.8	151	16.0	0.5		
Once or twice altogether	68	22.1	-2.5	307	32.6	1.5		
Not at all	11	3.6	-2.3	76	8.1	1.3		
Began smoking after enrolment								
Yes	21	6.8	-3.2	149	15.8	1.8	1	16.04**
No	287	93.2	1.3	792	84.2	-0.7		

*$p < .05$. **$p < .001$. Two-tailed.

Note. Smoking frequency was based on a question that asked about past 30 day use of tobacco. College students also began smoking earlier ($M = 14.82$ years, $SD = 2.32$ years) than university students ($M = 15.47$ years, $SD = 2.44$ years), $t\ (1247) = 4.06$, $p < .001$.

Table B10

Logistic Regression Models One and Two Predicting Current Smoking with Demographics and School Status in First Sample (N = 5,348)

Variable	Model One			Model Two		
	b	*OR*	95% CI	*b*	*OR*	95% CI
Constant	-6.57	.001	--	-5.76		--
Demographics						
Age	0.27	1.31	[1.23, 1.39]	0.22	1.24	[1.17, 1.32]
Gender				--		
Male	0.10	1.10	[0.96, 1.26]	0.09	1.09	[0.95, 1.26]
Female	--	--	--		--	--
Year of study	-0.43	0.65	[0.60, 0.71]	-0.29	0.75	[0.68, 0.83]
Living arrangement						
On-campus	-0.39	0.68	[0.55, 0.83]	-0.23	0.80	[0.64, 0.98]
Off-campus	0.24	1.27	[1.09, 1.49]	0.29	1.33	[1.14, 1.56]
Family home	--	--	--	--	--	--
Single parent						
Yes	0.02	1.03	[0.79, 1.33]	-0.02	0.98	[0.75, 1.28]
No	--	--	--	--	--	--
School status						

(continued)

Variable	Model One			Model Two		
	b	*OR*	95% CI	*B*	*OR*	95% CI
College	--	--	--	0.63	1.88	[1.57, 2.25]
University	--	--	--	--	--	--
Model Fitting Information						
Nagelkerke's R-square		0.04			0.05	
Hosmer and Lemeshow χ^2		9.08			9.31	

$^{*}p < .05$. $^{**}p < .001$. Two-tailed.

Note. Year of study was standardized for the separate institutional types by multiplying by its mean and dividing by its standard deviation.

Table B11

Logistic Regression Models Three and Four Predicting Current Smoking with Demographics, School Status & Personal Characteristics in First Sample (N = 5,348)

Variable	Model Three			Model Four		
	b	*OR*	95% CI	*b*	*OR*	95% CI
Constant	-6.70	0.001	--	-6.77	0.001	--
Demographics						
Age	0.23	1.26	[1.18, 1.35]	0.23	1.26	[1.18, 1.35]
Gender						
Male	0.11	1.11	[0.96, 1.29]	-0.13	--	[0.64, 1.20]
Female	--	--	--	--	--	--
Year of study	-0.29	0.75	[0.68, 0.83]	-0.29	0.75	[0.68, 0.83]
Living arrangement						
On-campus	-0.25	0.78	[0.62, 0.97]	-0.26	0.77	[0.62, 0.96]
Off-campus	0.19	1.20	[1.02, 1.42]	0.18	1.20	[1.02, 1.41]
Family home	--	--	--	--	--	--
Single parent						
Yes	-0.08	0.93	[0.70, 1.22]	-0.08	0.93	[0.70, 1.22]
No	--	--	--	--	--	--
School status						

(continued)

Variable	Model Three			Model Four		
	b	*OR*	95 % CI	*B*	*OR*	95 % CI
College	0.61	1.83	[1.52, 2.21]	1.03	--	[1.68, 4.68]
University	--	--	--	--	--	--
Personal characteristics						
Relative age						
1st quartile (Jan –Mar)	0.13	1.14	[0.94, 1.37]	0.12	--	[0.74, 1.72]
2nd quartile (Apr – Jun)	-0.14	0.87	[0.72, 1.06]	0.003	--	[0.66, 1.53]
3rd quartile (Jul – Sep)	0.05	1.05	[0.87, 1.27]	-0.25	--	[0.51, 1.20]
4th quartile (Oct – Dec)	--	--	--	--	--	--
Alcohol onset						
Early onset (≤13 years)	1.61	5.01	[4.03, 6.23]	1.21	--	[2.13, 5.31]
Middle onset (14-18 years)	0.78	2.17	[1.81, 2.61]	0.55	--	[1.18, 2.53]
Late onset (≥19 years)	-1.25	0.29	[0.15, 0.54]	-0.34	--	[0.08, 0.91]
No Use	--	--	--	--	--	--
Interactions						
School status x Relative Age						
School x 1st quartile	--	--	--	0.01	--	[0.63, 1.61]
School x 2nd quartile	--	--	--	-0.18	--	[0.52, 1.34]

(continued)

Variable	Model Three			Model Four		
	b	*OR*	95 % CI	*b*	*OR*	95 % CI
School x 3rd quartile	--	--	--	0.37	--	[0.90, 2.35]
School Status x Alcohol Onset						
School x early onset	--	--	--	0.51	--	[0.99, 2.80]
School x middle onset	--	--	--	0.29	--	[0.87, 2.07]
School x late onset	--	--	--	0.11	--	[0.27, 4.72]
School status x gender	--	--	--	0.30	--	[0.95, 1.92]
Model Fitting Information						
Nagelkerke's R-square		0.14			0.14	
Hosmer and Lemeshow χ^2		11.48			8.65	

$^{*}p < .05$. $^{**}p < .001$. Two-tailed.

Note. Year of study was standardized for the separate institutional types by multiplying by its mean and dividing by its standard deviation. When interactions were included in the model, only the regression coefficients were reported and interpreted.

Table B12

Logistic Regression Models Five and Six Predicting Current Smoking with Demographics, School Status & Socioenvironmental Influences in First Sample (N = 5,348)

Variable	Model Five			Model Six		
	b	*OR*	95% CI	*b*	*OR*	95% CI
Constant	-1.43	0.21	--	-1.06	0.35	--
Demographics						
Age	0.20	1.22	[1.14, 1.30]	0.19	1.21	[1.13, 1.29]
Gender						
Male	-0.07	0.93	[0.81, 1.08]	-0.15	--	[0.64, 1.17]
Female	--	--	--	--	--	--
Year of study	-0.27	0.76	[0.69, 0.84]	-0.26	0.77	[0.70, 0.85]
Living arrangement						
On-campus	-0.16	0.85	[0.69, 1.06]	-0.17	0.85	[0.68, 1.05]
Off-campus	0.36	1.43	[1.22, 1.68]	0.34	1.41	[1.20, 1.66]
Family home	--	--	--	--	--	--
Single parent						
Yes	0.08	1.09	[0.80, 1.49]	0.10	1.11	[0.81, 1.51]
No	--	--	--	--	--	--

(continued)

Variable	Model Five			Model Six		
	b	*OR*	95% CI	*b*	*OR*	95% CI
School status						
College	-0.13	0.88	[0.94, 1.38]	-3.24	--	[0.01, 0.22]
University	--	--	--	--	--	--
Socioenvironmental influences						
Family connectedness	0.05	1.06	[1.00, 1.12]	0.06	--	[1.00, 1.13]
High school connectedness	-0.13	0.88	[0.86, 0.89]	-0.14	--	[0.85, 0.88]
Interactions						
School x family connectedness	--	--	--	-0.02	--	[0.88, 1.11]
School x high school connectedness	--	--	--	0.13	--	[1.08, 1.20]
School x gender	--	--	--	0.09	--	[0.77, 1.55]
Model Fitting Information						
Nagelkerke R-square		0.13			0.13	
Hosmer and Lemeshow χ^2		50.72^{**}			28.34^{**}	

$^{*}p < .05$. $^{**}p < .001$. Two-tailed.

Note. Year of study was standardized for the separate institutional types by multiplying by its mean and dividing by its standard deviation. Family Connectedness was an average score created by summing a total of 10 items with response options 0-2. Scores ranged from 0-10 where higher scores represented more quality family connectedness. High school connectedness consisted of 8 questions on a 5-point Likert scale. Scores ranged from 8-40 where higher scores represented greater high school connectedness. When interactions were included in the model, only the regression coefficients were reported and interpreted.

Table B13

Logistic Regression Models Seven and Eight Predicting Current Smoking with Demographics, School Status, Personal Characteristics & Socioenvironmental Influences in First Sample (N = 5,348)

Variable	Model Seven			Model Eight		
	b	*OR*	95% CI	*b*	*OR*	95% CI
Constant	-2.41	0.09	--	-1.96	0.14	--
Demographics						
Age	0.21	1.23	[1.16, 1.32]	0.20	1.22	[1.14, 1.31]
Gender						
Male	-0.06	0.95	[0.82, 1.10]	-0.12	--	[0.65, 1.21]
Female	--	--	--	--	--	--
Year of study	-0.28	0.76	[0.68, 0.84]	-0.27	0.77	[0.69, 0.85]
Living arrangement						
On-campus	-0.19	0.83	[0.66, 1.04]	-0.19	0.83	[0.66, 1.03]
Off-campus	0.26	1.29	[1.09, 1.53	0.25	1.28	[1.08, 1.51]
Family home	--	--	--	--	--	--
Single parent						
Yes	-0.05	0.95	[0.69, 1.32]	-0.03	0.97	[0.70, 1.35]
No	--	--	--	--	--	--

(continued)

Variable	Model Seven			Model Eight		
	b	*OR*	95% CI	*b*	*OR*	95% CI
School Status						
College	0.10	1.10	[0.90, 1.34]	-2.91	--	[0.01, 0.33]]
University	--	--	--	--	--	--
Personal characteristics						
Relative age						
1st quartile (Jan –Mar)	0.21	1.24	[1.02, 1.51]	0.13	--	[0.75, 1.74]
2nd quartile (Apr – Jun)	-0.05	0.95	[0.78, 1.16]	0.01	--	[0.67, 1.54]
3rd quartile (Jul – Sep)	0.09	1.09	0.90, 1.33]	-0.24	--	[0.51, 1.21]
4th quartile (Oct – Dec)	--	--	--	--	--	--
Alcohol onset						
Early onset (≤13 years)	1.63	5.09	[4.07, 6.37]	1.20	--	[2.11, 5.26]
Middle onset (14-18 years)	0.84	2.31	[1.91, 2.79]	0.54	--	[1.18, 2.52]
Late onset (≥19 years)	-1.23	0.29	[0.15, 0.56]	-1.32	--	[0.08, 0.93]
No use	--	--	--	--	--	--
Socioenvironmental influences						
Family connectedness	0.04	1.04	[0.98, 1.10]	0.04	--	[0.98, 1.11]
High school connectedness	-0.14	0.87	[0.86, 0.89]	-0.15	--	[0.85, 0.88]

(continued)

Variable	Model Seven			Model Eight		
	b	*OR*	95% CI	*b*	*OR*	95% CI
Interactions						
School status x relative age						
School x 1st quartile	--	--	--	0.10	--	[0.69, 1.79]
School x 2nd quartile	--	--	--	-0.09	--	[0.57, 1.48]
School x 3rd quartile	--	--	--	0.41	--	[0.93, 2.45]
School status x alcohol onset	--	--				
School x early onset	--	--	--	0.55	--	[1.03, 2.93]
School x middle onset	--	--	--	0.38	--	[0.94, 2.27]
School x late onset	--	--	--	0.11	--	[0.26, 4.76]
School status x family connectedness	--	--	--	-0.02	--	[0.87, 1.11]
School status x high school connectedness	--	--	--	0.13	--	[1.08, 1.21]
School status x gender	--	--	--	0.08	--	[0.75, 1.54]
Model Fitting Information						
Nagelkerke's R-square		0.20			0.21	
Hosmer and Lemeshow χ^2		12.55			12.23	

$^{*}p < .05$. $^{**}p < .001$. Two-tailed.

Note. Year of study was standardized for the separate institutional types by multiplying by its mean and dividing by its standard deviation. Family Connectedness was an average score created by summing a total of 10 items with response options 0 and 1. Scores ranged from 0-10 where higher scores represented greater family connectedness. High school connectedness consisted of 8 questions on a 5-point Likert scale. Scores ranged from 8-40 where higher scores represented greater high school connectedness. When interactions were included in the model, only the regression coefficients were reported and interpreted

Appendix C: Prevalence Study Questionnaire

Registrar Office Please Note: This is what has been approved by the home institution (Brock University). There is the possibility that the on-line text may change depending on requests from the participating institutions.

In order to determine whether you are eligible to complete the survey please answer the following questions:

Age Today: __ __/__ __ (years / months) Institution Code: _____

The questions above *can be* used for screening: participants under 18 years of age will see a screen thanking them and offering entry in the draw; those 18 years and older will be given access to the survey)

Subject # _____

Let's begin with some information about you, and your family. Indicate the answer that comes closest to describing you.

Gender
☐ *1. female*
☐ *2. male*

Date of birth __ __/__ __/__ __ __ __ (day month year)

If you weren't born in Canada, when did you arrive in Canada? __ __/__ __/__ __ __ (day month year)

Citizenship status:
☐ *1.Canadian*
☐ *2. Other (specify)* _____

What is your first language? _____

Marital status:
☐ *1. Single*
☐ *2. Other (please specify)*

Do you have children?
☐ *1. No*
☐ *2. Yes*

(If yes) How many children do you have? _____ (*fill in number*)

(If yes) Do your children live with you?

☐ *1. No*

☐ *2. Yes*

Do you consider yourself to have moved out permanently from the home of your parent(s) or guardian(s)?

☐ *1. Don't know*

☐ *2. No*

☐ *3. Yes*

What option *best* describes where you live?

☐ *1. in campus residence*

☐ *2. at my family home*

☐ *3. at a relative's home*

☐ *4. with another family (boarding)*

☐ *5. off campus – alone*

☐ *6. off campus – with other students*

☐ *7. off campus – with non students*

☐ *8. off campus – with students and non students*

☐ *9. off campus – with romantic partner or spouse*

The next series of questions ask about your friends' and your family members' use of cigarettes.

How many people do you consider to be in your immediate family? _____

How often do the members of your immediate family smoke?

	0. Never	*1. Once or twice a month*	*2. On some days each week*	*3. Almost every day*	*4. Every day*
Family member 1					
Family member 2					
Family member 3					
Family member 4					
Family member 5					

Think of your 4 closest *male* friends. How often do your 4 closest *male* friends smoke?

	0. Never	*1. Once or twice a month*	*2. On some days each week*	*3. Almost every day*	*4. Every day*
Male Friend 1					
Male Friend 2					
Male Friend 3					
Male Friend 4					

Think of your 4 closest *female* friends. How often do your 4 closest *female* friends smoke?

	0. Never	*1. Once or twice a month*	*2. On some days each week*	*3. Almost every day*	*4. Every day*

Female Friend 1					
Female Friend 2					
Female Friend 3					
Female Friend 4					

Think about room-mates, or people who are not immediate family with whom you share housing (people with whom you share a dorm room, or an apartment or a house).

How many people do you share housing with? _____

How often do your room-mates smoke?

	0. Never	*1. Once or twice a month*	*2. On some days each week*	*3. Almost every day*	*4. Every day*
Room-mate 1					
Room-mate 2					
Room-mate 3					
Room-mate 4					
Room-mate 5					

Are any of your room-mates also among your "closest friends"?

☐ *1. No*

☐ *2.Yes*

If Yes, specify who (e.g. Male Friend #2 and Roommate#1 are the same person):

_____

Not counting yourself, how many people smoke in your home (house, apartment, room) every day or almost every day? _____ *(fill in number)*

Think about the place where you live. In that living arrangement is <u>indoor</u> smoking restricted?

☐ *1. Don't know*

☐ *2. No*

☐ *3. Yes*

(If Yes) Are these restrictions:

☐ *1. University/College policy*

☐ *2. Municipal by-law*

☐ *3. Provincial law*

☐ *4. limited to your living arrangement*

(If Yes) Do you follow these restrictions?

☐ *1. Never*

☐ *2. Sometimes*

☐ *3. Always*

Think about the place where you live. In that living arrangement is <u>outdoor</u> smoking restricted?

☐ *1. Don't know*

☐ *2. No*

☐ *3. Yes*

(If Yes) Are these restrictions:

☐ *1. University/College policy*

☐ *2. Municipal by-law*

☐ *3. Provincial law*

☐ *4. limited to your living arrangement*

(If Yes) Do you follow these restrictions?

☐ *1. Never*
☐ *2. Sometimes*
☐ *3. Always*

Before we ask about your own experiences with cigarettes and smoking, we would like to know more about your past secondary school experiences and your current post-secondary education. Please indicate the answer that comes closest to describing you.

What is your highest level of education *prior to* your current program:

☐ *1. Grade 11 – from Quebec or Nfld only*
☐ *2. Grade 12 – from any province other than Quebec, Nfld.*
☐ *3. CEGEP – Quebec*
☐ *4. OAC – Ontario*
☐ *5. Community College Diploma or Certificate*
☐ *6. Specialized training (e.g. hairdressing, welding, massage therapy, trade apprenticeship, etc.)*
☐ *7. University Undergraduate Degree*
☐ *8. Other (specify)* _____

When did you finish secondary school (e.g. high school)? __ __ / __ __ __ __
month year

Where was your secondary school (e.g. high school) located? _____/_____
town or city or county province

Indicate how well each of these statements describes your *overall* secondary school (e.g. high school) experience by circling the appropriate number.

I got along well with my teachers.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I did as little as possible; I just wanted to get by.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I paid attention to the teachers.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I was interested in what I was learning in class.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I felt like an outsider or like I was left out of things at school.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I had friends at school to whom I could talk about personal things.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I liked to participate in many school activities e.g. clubs, sports, drama.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

People at school were interested in what I had to say.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

Among all students at your previous school (e.g. high school) what percent do you believe smoked cigarettes? _____%

***Among the students who smoked*, how many do you believe smoked every day?**

- ☐ *1. None or almost none*
- ☐ *2. Minority*
- ☐ *3. About half*
- ☐ *4. Majority*
- ☐ *5. Nearly all or all*

Current Institution: _____ pulldown menu

Current Faculty: _____ **pulldown menu of choices appropriate to colleges and universities**

Year of study in your current program: _____

Status:

- ☐ *1. Part-time*
- ☐ *2. Full-time*

Did you take time off school before beginning your current college/university program?

- ☐ *2. No*
- ☐ *1. Yes*

(If yes) How long? _____ years

Indicate how well each of these statements describes your *overall* college or university experience to date by circling the appropriate number.

I get along well with my professors.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I do as little as possible; I just want to get by.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I pay attention to the professors.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I am interested in what I am learning in class.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I feel like an outsider or like I am left out of things at school.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I have trouble keeping up with the workload.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I have become good friends with other students at school.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I feel like I am just a number to the school.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I have friends at school that I can talk to about personal things.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

I like to participate in many university activities e.g. clubs, sports, drama.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

People at school are interested in what I have to say.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	2.	3.	4.	5.

Among all students at your college or university, what percent do you believe smoke cigarettes?

_____%

***Among just those students who smoke*, how many do you believe smoke every day?**

- ☐ *1. None or almost none*
- ☐ *2. Minority*
- ☐ *3. About half*
- ☐ *4. Majority*
- ☐ *5. Nearly all or all*

Are there smoking regulations that restrict <u>indoor</u> smoking *at your school?*

- ☐ *1. Don't know*
- ☐ *2. No*
- ☐ *3. Yes*

(If Yes) Are these regulations:

- ☐ *1. University/College policy*

☐ *2. Municipal by-law*
☐ *3. Provincial law*

(If Yes) Do you follow these regulations?

☐ *1. Never*
☐ *2. Sometimes*
☐ *3. Always*

Are there smoking regulations that restrict <u>outdoor</u> smoking *at your school?*

☐ *1. Don't know*
☐ *2. No*
☐ *3. Yes*

(If Yes) Are these regulations:

☐ *1. University/College policy*
☐ *2. Municipal by-law*
☐ *3. Provincial law*

(If Yes) Do you follow these regulations?

☐ *1. Never*
☐ *2. Sometimes*
☐ *3. Always*

We would like to ask some questions about your smoking and health. Indicate the answer that comes closest to describing you, or to describing your opinion.

At university/college entrance, and at this time, would you consider yourself a:

	university/college entrance		now	
1. non-smoker, who never smokes	☐		☐	
2. non-smoker, who smokes sometimes	☐		☐	
3. light smoker	☐		☐	
4. regular smoker		☐		☐
5. ex-smoker who has totally quit smoking		☐		☐

1. **How old were you when you smoked your first puff of a cigarette?**
   ☐ *1. _____ (age in years)*
   ☐ *2. I have never smoked even a puff*
2. **How old were you when you smoked your first whole cigarette?**
   ☐ *1. _____ (age in years)*
   ☐ *2. I have never smoked a whole cigarette*
3. **How old were you when you became a smoker?**
   ☐ *1. _____ (age in years)*
   ☐ *2. I never became a smoker*
4. **Have you smoked 100 or more cigarettes in your life?**
   ☐ *1. Yes*
   ☐ *2. No*
5. **Do you *currently* smoke – even just a bit?**
   ☐ *1. No, I have never smoked cigarettes*
   ☐ *2. No, I quit more than 6 months ago*

Age (in years) at quitting _____

☐ *3. No, I quit within the last 6 months*

☐ *4. Yes, I currently smoke cigarettes, but not every day*

☐ *5. Yes, I currently smoke cigarettes every day*

6. **Think of the past 30 days. Did you smoke a cigarette, *even a puff*?**

☐ *1. No, not even a puff*

☐ *2.Yes*

7. **(If Yes) In the *past 30 days*, how often did you smoke a cigarette, *even a puff*?**

☐ *4. every day*

☐ *3. almost every day*

☐ *2. on some days each week*

☐ *1. once or twice all together*

☐ *0. I did not smoke at all*

8. **On the days that you smoked, how many cigarettes did you usually smoke?**

☐ *1. None*

☐ *2. A few puffs or less*

☐ *3. 1-2 cigarettes per day*

☐ *4. 3-5 cigarettes per day*

☐ *5. 6-10 cigarettes per day*

☐ *6. 11-19 cigarettes per day*

☐ *7. 20 or more cigarettes per day*

9. **In the past month, how many times have you intentionally quit smoking for at least 24 hours?** _____ *(write 0 if you did not try to quit at all)*

10. **Are you now seriously thinking of quitting smoking?**

☐ *Yes, within the next 7 days*

☐ *Yes, within the next 8 to 30 days*

☐ *Yes, within the next 6 months*

☐ *No, not thinking of quitting*

11. **When you are free to smoke whenever you want, how soon after waking do you smoke your first cigarette?**

☐ *1. Within 5 minutes*

☐ *2. Within 6 to 30 minutes*

☐ *3. Within 31 to 60 minutes*

☐ *4. Within 1- 2 hrs*

☐ *5. Over 2 hours*

Think of the *past week*. Indicate the *number* of tobacco products you used on each day. Write 0 if you did not use that tobacco product on that day.

	Mon	Tues	Wed	Thur	Fri	Sat	Sun
# of Cigarette(s)							
# of Cigar(s)							
Chew							

Please mark an 'L' beside any days where the *majority* of time was spent in leisure activities (e.g. hobbies, sports, travel, hangin' out)

During the past week, was your use of cigarettes:
☐ *1. Greater than usual?*
☐ *2. Less than usual?*
☐ *3. About the same as usual?*

During the past week, was your use of cigars:
☐ *1. Greater than usual?*
☐ *2. Less than usual?*
☐ *3. About the same as usual?*

During the past week, was your use of chew tobacco:
☐ *1. Greater than usual?*
☐ *2. Less than usual?*
☐ *3. About the same as usual?*

Do you ever feel that your friends are putting pressure on you to smoke, or to smoke more often, even when you don't want to smoking?
☐ *0. Never*
☐ *1. Rarely*
☐ *2. Occasionally*
☐ *3. Fairly often*
☐ *4. Very often*

Would a non-smoker joining you feel out of place?
☐ *4. Never*
☐ *3. Rarely*
☐ *2. Occasionally*
☐ *1. Fairly often*
☐ *0. Very often*

During the past month was there an occasion when you were about to smoke a cigarette but resisted the urge?
☐ *1. Yes*
☐ *2. No, I never resisted the urge*
☐ *3. No, I never had the urge to smoke*

In what situations do you think students at your college or university are most likely to smoke? (*check all that apply***)**
☐ *1. At a party*
☐ *2. At a bar*
☐ *3. With friends who smoke*
☐ *4. In times of stress*
☐ *5. Alone*

In what situations are you most likely to smoke? (*check all that apply***)**
☐ *1. At a party*
☐ *2. At a bar*
☐ *3. With friends who smoke*
☐ *4. In times of stress*
☐ *5. Alone*
☐ *6. I do not smoke*

People should be allowed to smoke at a bar

☐ *1. Strongly disagree*
☐ *2. Somewhat disagree*
☐ *3. Somewhat agree*
☐ *4. Strongly agree*

People should be allowed to smoke at a private party

☐ *1. Strongly disagree*
☐ *2. Somewhat disagree*
☐ *3. Somewhat agree*
☐ *4. Strongly agree*

Do you know of any programs on campus that address tobacco and smoking?

☐ *1. no*
☐ *2. yes*

What are they? (*Please name as many as you can*)

_____

Since September, have you visited your campus's Student Health Care facility?

☐ *1. No*
☐ *2. Yes*

(If yes) Did a health professional at your campus's Student Health Care facility *ask you* whether you use tobacco?

☐ *1. No*
☐ *2. Yes*

(If yes) Which health professional(s) asked about your smoking?

☐ *1. doctor*
☐ *2. nurse*
☐ *3. counsellor*
☐ *4. therapist*
☐ *5. other:*

(If yes) Did the health professional(s) who asked about your smoking *advise you* to quit?

☐ *1. No, because I don't smoke*
☐ *2. No, none of the health professionals advised me to quit*
☐ *3. Yes, at least one health professional advised me to quit*

(If yes) Were you offered any of these types of assistance? *(check all that apply)*

☐ *1. resources, such as pamphlets, booklets, brochures, etc.*
☐ *2. verbal information about how to use nicotine gum or the patch*
☐ *3. a prescription for smoking cessation medication (e.g., Zyban)*
☐ *4. a referral you to another health professional*
☐ *5. advice to to make a follow-up appointment to talk about quitting*
☐ *6. verbal information about campus programs (e.g., Leave The Pack Behind)*

In general, *compared to other people your age*, would you say your health is:

☐ *5. Excellent*
☐ *4. Very good*
☐ *3. Good*

☐ *2. Fair*
☐ *1. Poor*

Do you consider yourself to be (choose one)?
☐ *1. Very overweight*
☐ *2. Somewhat overweight*
☐ *3. Normal weight*
☐ *4. Somewhat underweight*
☐ *5. Very underweight*

What is your present weight? _____*kg.* **OR** _____ *lbs.*

How tall are you? _____*cm* **OR** _____*ft.* _____*in.*

We are interested in your relationship with the parent(s) or guardian(s) you lived with as a teenager. In answering the questions, think about the parent(s) or guardian(s) you lived with the majority of the time while you were in secondary school.

What do you think was usually true or usually false about your father (stepfather, male guardian) while you were in high school? Leave these blank if you did not live with him the majority of the time.

I could count on him to help me out, if I had some kind of problem.
☐ *Usually true* ☐ *Usually false*

He kept pushing me to do my best in whatever I did.
☐ *Usually true* ☐ *Usually false*

He kept pushing me to think independently.
☐ *Usually true* ☐ *Usually false*

He helped me with my school work if there was something I didn't understand.
☐ *Usually true* ☐ *Usually false*

When he wanted me to do something, he explained why.
☐ *Usually true* ☐ *Usually false*

What do you think was usually true or usually false about your mother (stepmother, female guardian) while you were in high school? Leave these blank if you did not live with her the majority of the time.

I could count on her to help me out, if I had some kind of problem.
☐ *Usually true* ☐ *Usually false*

She kept pushing me to do my best in whatever I did.
☐ *Usually true* ☐ *Usually false*

She kept pushing me to think independently.
☐ *Usually true* ☐ *Usually false*

She helped me with my school work if there was something I didn't understand.

☐ *Usually true* ☐ *Usually false*

When she wanted me to do something, she explained why.

☐ *Usually true* ☐ *Usually false*

When you got a poor grade in high school, how often did your parent(s) or guardian(s) encourage you to try harder?

☐ *Never* ☐ *Sometimes* ☐ *Usually*

When you got a good grade in high school, how often did your parent(s) or guardian(s) praise you?

☐ *Never* ☐ *Sometimes* ☐ *Usually*

When you were in high school, how much did your parent(s) or guardian(s) really know who your friends were?

☐ *Didn't know them at all* ☐ *Knew them a little* ☐ *Knew them a lot*

When you were in high school, how often did these things happen in your family?

My parent(s) or guardian(s) spent time just talking with me.

☐ *Almost every day* ☐ *A few times a week* ☐ *A few times a month* ☐ *Almost never*

My family did something fun together.

☐ *Almost every day* ☐ *A few times a week* ☐ *A few times a month* ☐ *Almost never*

Think about your last year of high school. In a typical week on a SCHOOL NIGHT (Sunday to Thursday) what was the latest you could stay out?

☐ *Not allowed out*
☐ *Before 8:00*
☐ *8:00 to 8:59*
☐ *9:00 to 9:59*
☐ *10:00 to 10:59*
☐ *11:00 or later*
☐ *As late as I wanted*

Think about your last year of high school. In a typical week on a FRIDAY or SATURDAY night what was the latest you could stay out?

☐ *Not allowed out*
☐ *Before 9:00*
☐ *9:00 to 9:59*
☐ *10:00 to 10:59*
☐ *11:00 to 11:59*
☐ *12:00 to 12:59*
☐ *1:00 to 1:59*
☐ *After 2:00*
☐ *As late as I wanted*

When you were in high school did your parent(s) or guardian(s) knew exactly where you were most afternoons after school?

☐ *Yes* ☐ *No*

When you were in high school, how much did your parent(s) or guardian(s) TRY to know where you went at night?

☐ *Didn't try at all* ☐ *Tried a little* ☐ *Tried a lot*

When you were in high school, how much did your parent(s) or guardian(s) TRY to know what you did with your free time?

☐ *Didn't try at all* ☐ *Tried a little* ☐ *Tried a lot*

When you were in high school, how much did your parent(s) or guardian(s) TRY to know where you were most afternoons after school?

☐ *Didn't try at all* ☐ *Tried a little* ☐ *Tried a lot*

When you were in high school, how much did your parent(s) or guardian(s) REALLY know where you went at night?

☐ *Didn't know at all* ☐ *Knew a little* ☐ *Knew a lot*

When you were in high school, how much did your parent(s) or guardian(s) REALLY know what you did with your free time?

☐ *Didn't know at all* ☐ *Knew a little* ☐ *Knew a lot*

When you were in high school, how much did your parent(s) or guardian(s) REALLY know where you were most afternoons after school?

☐ *Didn't know at all* ☐ *Knew a little* ☐ *Knew a lot*

Finally, we would like to ask some questions about your use of substances other than Tobacco. Indicate the answer that comes closest to describing you, or to describing your opinion. For the following questions, cannabis includes marijuana, grass, pot, hash, hash oil etc. And an alcoholic drink includes a bottle of beer or a bottled cooler, a 4 oz glass of wine, or a 1 oz shot of spirits.

Think of the *past 30 days*. In the past 30 days, how often did you use cannabis?

☐ *4. every day*
☐ *3. almost every day*
☐ *2. on some days each week*
☐ *1. once or twice all together*
☐ *0. not at all*

During the past 30 days, was your use of cannabis:

1. Greater than usual?
2. Less than usual?
3. About the same as usual?

How old were you when you first consumed cannabis?

1. _____ *(age in years)* *2. I have never consumed cannabis*

Among all students at your previous school (e.g. high school) what percent do you believe used cannabis? _____**%**

Among all students at your college or university, what percent do you believe use cannabis? _____**%**

Among just those students *who use cannabis*, how many do so at least once a week?

1. None or almost none
2. Minority
3. About half
4. Majority
5. Nearly all or all
6. Don't know

Think of the *past 30 days*. In the past 30 days, how often did you consume alcohol?

4. every day
3. almost every day
2. on some days each week
1. once or twice all together
0. not at all

During the past 30 days, was your use of alcohol:

1. Greater than usual?
2. Less than usual?
3. About the same as usual?

How old were you when you first consumed a whole alcoholic drink?

1. _____ (age in years) *2. I have never consumed a whole alcoholic drink*

Among all students at your previous school (e.g. high school) what percent do you believe drank alcohol? _____%

Among all students at your college or university, what percent do you believe drink alcohol? _____%

Among just those students *who drink alcohol*, how many do so at least once a week?

1. None or almost none
2. Minority
3. About half
4. Majority
5. Nearly all or all
6. Don't know